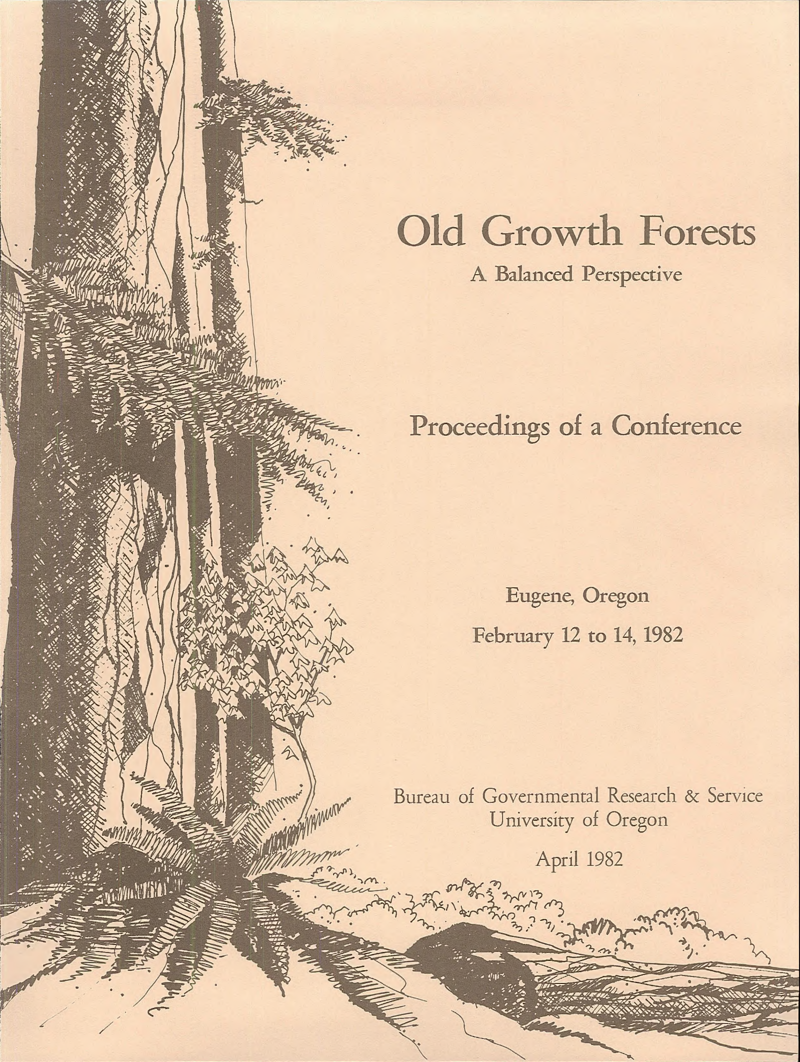

Old Growth Forests

A Balanced Perspective

Proceedings of a Conference

Eugene, Oregon

February 12 to 14, 1982

Bureau of Governmental Research & Service
University of Oregon

April 1982

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OLD GROWTH FORESTS: A BALANCED PERSPECTIVE

Proceedings of a Conference

Sponsored by:

League of Women Voters of Central Lane County

and

Bureau of Governmental Research and Service
University of Oregon

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BUREAU OF GOVERNMENTAL RESEARCH AND SERVICE
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FOREWORD

The idea for an "old growth conference" stemmed from an informal meeting of a few concerned individuals in July 1981. The group agreed that there should be "a regional old growth conference that explores the ecological, social, and economic perspectives in a balanced way," and that it should have the following objectives.

- Use a balanced perspective to get a better understanding of a significant regional issue.
- Educate an interested public and land managers about the values of old growth forest and explore options for management.
- Provide a forum for scientists to transfer scientific knowledge to the public in a form they can use.
- Provide the public information necessary to make an informed choice.
- Define what old growth is in an acceptable, scientific way.
- Examine an historical perspective of what happens when old growth is removed from other areas (foreign countries, lake states) so the public can understand what happens there.
- Provide the public with facts and different points of view.
- Determine what will happen to wildlife populations that are dependent on old growth.
- Create an opportunity for dialogue between public, governmental agencies, and other parties to promote understanding.
- Develop improved relations between polarized parties (i.e., conservationists, agencies, industry).
- Demonstrate the value of regionally-sponsored conferences in education of the public in a balanced way.

It is satisfying to note that most of these objectives were achieved. The conference was well attended and well publicized, and its contribution to public understanding of the old growth issues was enormous.

The League of Women Voters of Central Lane County and the University of Oregon's Bureau of Governmental Research and Service co-sponsored the conference. The League provided leadership in developing the program through its representative Laurie Power, who chaired the Steering Committee and personally handled the executive functions related to the conference. The Bureau provided back-up staff and logistical support and edited and published these proceedings.

The success of the conference, however, must be attributed primarily to the Steering Committee, which consisted of the following representatives of resource agenices, environmental organizations, and timber industry groups.

Rolf Anderson
Willamette National Forest

Bob Chadwick
U.S. Forest Service

Paul Ehinger
Western Resources Alliance

Jerry Franklin
Pacific Northwest Forest
and Range Experiment Station

Andy Kerr
Oregon Wilderness Coalition

Jerry Mason
Willamette National Forest

Francis Schiller
Bureau of Land Management

Laurie Power, Committee Chair
League of Women Voters
of Central Lane County

George Carroll
Department of Biology, UO

Emmy Dale
Obsidians

Sydney Herbert
Lane County Audubon Society

Frank Newton
Oregon State Department
of Fish and Wildlife

Tom Lawler
Bohemia, Inc.

Lynn Richmond
Tree Farmer and Developer

Kenneth Tollenaar
Bureau of Governmental Research, UO

Katherine Tri
Conference Organizer
Bureau of Governmental Research, UO

The Committee met monthly from September 1981 to January 1982 and proved in the course of its own deliberations that people of good will can cooperate in worthwhile endeavors despite widely varying points of view.

The Committee wishes to thank Bob Longcore, Willamette National Forest, for designing the logo for the conference, and the following University of Oregon students for their assistance in administering the conference itself: Jim Everett, Business Administration; Mike Gilmore, Urban and Regional Planning; Jim Minard, Community Service and Public Affairs; and Garey Butler, School of Law. Special recognition is due Pete Kent, graduate student at the University of Oregon, School of Journalism, who assisted with the editing and publication of these proceedings.

Finally, we acknowledge with deep gratitude the financial support of the University of Oregon Foundation and the several individuals and organizations who made contributions to the Foundation on behalf of the Old Growth Conference. Their generosity plus the successful efforts of everyone involved have added to our knowledge and understanding of this important issue.

Respectfully submitted,

Kenneth C. Tollenaar

Kenneth C. Tollenaar

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* Photographs courtesy of United States Forest Service

BACKGROUND PAPER ON OLD GROWTH FORESTS

Prepared by: Kenneth Tollenaar, Director, Bureau of Governmental Research and Service, University of Oregon; and

Laurie Power, League of Women Voters

BACKGROUND PAPER ON OLD GROWTH FORESTS*

Ken Tollenaar and Laurie Power

Public concern over the fate of old growth* forests has risen sharply over the last few years. Clearly, the vast tracts of unbroken old growth Douglas-fir and other forests that once occurred in the Pacific Northwest are gone. Today about 5 percent of the original natural endowment of old growth forests is covered by protective designations such as wilderness, natural areas, etc. Apparently there is no reliable estimate of the amount of old growth remaining on commercial forest lands.

What is so special about these forests? What makes people care about their future?

First, old growth trees have important ecological roles. Old growth forests provide necessary habitat to a variety of wildlife, numerous plant species, many species of mosses and lichens, and over 1,500 species of invertebrates. The living trees play important roles in the cycling of elements, nutrients and water throughout the forest environment. Deteriorating logs are a source of nutrients, minerals and humus as well as being a home to organisms that are indispensable to forest food chains. Standing dead trees, or snags, are homes to animals, birds and insects. Large logs in streams distribute aquatic habitats, provide stability of streambeds and banks, and route sediments and water. The clear, cold water that flows through old growth forests is critical for fisheries as well as for municipal uses. Many scientists believe that research on old growth ecology is just getting started. As more studies are completed, our understanding of the ecological function of these trees will increase immeasurably.

Second, old growth has special values for the wood products industry. Timber from old growth is strong, durable and easily worked. Its grain is straight and free from knots. These characteristics create a great demand from consumers for construction material for homes and other uses.

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*The Forest Service uses the following designation for old growth:

> "An old growth stand is defined as any stand of trees 10 acres or greater generally containing the following characteristics:
>
> > "Stands contain mature and overmature trees in the overstory and are well into the mature growth stage.
> >
> > "Stands will usually contain a multi-layered canopy and trees of several age classes.
> >
> > "Standing dead trees and down material are present.
> >
> > "Evidence of man's activities may be present but do not significantly alter the other characteristics and would be a subordinate factor in a description of such a stand."

Department of Agriculture, United States Forest Service, Pacific Northwest Region, Draft Pacific Northwest Region Plan, 1981.

Old growth Douglas-fir is used to make construction studs, plywood, particle board and attractive veneer for interior decoration. Waste wood from mill processes becomes pulp and paper. Sawdust, bark and small pieces of waste wood are used to fire boilers to create heat, steam and electricity.

Third, old growth forests provide the public with special recreational opportunities. People using the forest for recreational purposes value old growth stands for their aesthetic and spiritual meanings. Old trees symbolize our links to the past and provide an important visual experience of the natural successional processes of the forest environment.

Older trees grow at declining rates. The wood products industry believes that too much old growth is lost to deterioration, insects and disease before it is harvested. The industry reasons that old stands should be harvested before any more of the wood is destroyed and then be immediately replaced with young healthy seedlings. This action would increase the amount of wood produced each year and would also reduce the amount that is lost to insects and disease.

On the other hand, conservationists believe that too much old growth has been harvested and that public forest lands should be managed for more old growth, not less. They point out that already many plant and animal species appear to be threatened because of loss of old growth habitat. They note that old growth produces significant non-commodity economic values, including high water quality, genetic stability, and outdoor recreational opportunities.

Given these multiple, often conflicting uses of a decreasing resource, how do we manage the remaining old growth forests? The answers we give depend on personal values and what we think the Northwest's forests should be like in the future. Should we preserve old growth, harvest it on long rotations, liquidate it, or provide for individual old growth features in timber management planning? Can we do all these things? Or some? Or none? What are the options available to the managers of most old growth, the Forest Service and the Bureau of Land Management?

Exploring options and discussing the many viewpoints on old growth forests are the purposes of the conference in Eugene on February 13, 1982. People who attend the conference and/or read the proceedings will come away better informed about the nature of old growth.

ECOLOGICAL ASPECTS

Speaker: Dr. **Jerry Franklin**, Chief Plant Ecologist, Pacific Northwest Forest and Range Experiment Station, U.S. Forest Service, Corvallis

Response Panel:

Dr. **Olof C. Wallmo**, Wildlife Biologist, U.S. Forest Service, Retired, Bozeman, Montana
Dr. **Jack Ward Thomas**, Chief Research Wildlife Biologist, Pacific Northwest Forest and Range Experiment Station, La Grande, Oregon
Dr. **E. Charles Meslow**, Associate Professor, Oregon State University; Leader, Oregon Cooperative Wildlife Research Unit, Corvallis
Dr. **Robert Vincent**, Wildlife Consultant, Philomath, Oregon

Moderator: Mary Sherriffs, League of Women Voters

OLD GROWTH FORESTS IN THE PACIFIC NORTHWEST: AN ECOLOGICAL VIEW*

Dr. Jerry Franklin

When settlers arrived in the Pacific Northwest 150 years ago, they found a vast region densely clad with virgin forests of large evergreen trees, the majority of them 200 to more than 1,000 years old. Initially these forests were considered inexhaustible and an impediment to settlement. They were slashed and burned to make way for farms and towns. The forests quickly came to be viewed as a major natural resource, however, and timber cutting became the economic mainstay of the region. In the last century the center of the industry has shifted from Puget Sound to southwestern Oregon as accessible virgin forests have been cutover.

Virgin old-growth forests are still common in the mountains of the Pacific Northwest but their extent is shrinking rapidly. Most of the remaining old-growth forests are on Federal lands, particularly lands managed by the U.S. Department of Agriculture Forest Service and U.S. Department of Interior Bureau of Land Management. Substantial acreages of old-growth forest have been preserved in National Parks, Wilderness, Research Natural Areas, and other reserves. Nonetheless, disposition of the remaining old-growth stands on public lands is highly controversial. There are strongly held opinions on such questions as whether additional old-growth forest should be reserved, for what purposes and where, and whether liquidation of this resource should be accelerated. How are other resource values, such as specific birds or mammals, affected by cutting the old growth?

This paper is an introduction to the ecological characteristics of old-growth forests in the Pacific Northwest. Old growth is contrasted with other forest stages (e.g., young forests) whenever possible, although information for such comparisons is often surprisingly limited. Comprehensive ecological knowledge is limited for all successional stages, including old growth. Douglas-fir (Pseudotsuga menziesii) forests are the major focus, although the principles outlined are broadly applicable to forests in the region, as will be pointed out. Much of the information has been generated by Forest Service and university scientists working at the H. J. Andrews Experimental Forest located on the Willamette National Forest but other sites have been extensively utilized including locations in the Cascade Range from Mount Rainier to northern California, in the Coast Ranges of Oregon, and in the Olympic Mountains. My purpose is to provide factual information for use in forming opinions and making decisions on this important resource issue.

---

* Prepared paper (copy prepared in the U.S. Forest Service Forestry Services Lab, Corvallis, Oregon).

Old Growth is One Stage In Forest Succession

Forests are dynamic. They change constantly in form and content--on time scales from milliseconds to millenia. The dominant long-term pattern of change is "succession"; it generally begins when a fire, windstorm, or other disturbance destroys the existing forest. A new forest is initiated which progresses through a sequence of forest stages. For Douglas-fir forests a convenient set of stages is:

Stage	Typical duration under natural conditions
Herb and shrub	30 years
Young forest	30 to 100 years
Mature forest	100 to 200 years
Old-growth forest	200 to 800 years
Climax forest	over 800 years

Transitions from one stage to another occur gradually. Stages also vary widely in duration so the time scale indicated above is arbitrary. A much more elaborate breakdown of stages is, of course, possible; e.g., old-growth forests change quite a bit over 600 years.

Old-growth forests are the developmental stage between mature and climax forests. If left undisturbed, old-growth forests will evolve into climax forests; but a major disturbance can destroy the old-growth forest and return the site to the herb and shrub stage. The destroyed old-growth forest is strongly linked in this case to the regenerating forest, because huge amounts of dead wood are carried over from one stage to the other. Natural disturbances, such as fire and windthrow, kill trees but rarely consume much of the wood. In natural successional sequences, the old-growth stand also influences the young forest in other ways such as by providing the seed source.

Each forest stage has distinctive and positive attributes and functions. The herb and shrub-dominated periods that follow a major disturbance, such as fire or clearcutting, are typically richest in species of higher plants and animals. Many species survive the disturbance and many other species invade rapidly in response to the open environment and, in the case of animals, abundance of food. The young forest is the period of rapid tree growth in which annual additions of wood are greatest. Old-growth forests yield water of superior quality because few nutrients find their way through the soil into groundwater and levels of erosion are low.

It is important to differentiate old-growth and climax forests because they are not equivalent concepts as commonly used. Classic old-growth forests in the Pacific Northwest are usually characterized by species such as Douglas-fir, noble fir (Abies procera) (at high elevations), and Sitka spruce (Picea sitchensis) (on the coast). These species generally cannot establish themselves in a typical shaded forest but by virtue of growth habit and long life persist as awesome specimens for many centuries. They are sometimes referred to as "pioneers." Shade-tolerant tree species, such as western hemlock (Tsuga heterophylla) and Pacific silver fir (Abies amabilis), do establish themselves under the forest canopies and eventually grow to occupy canopy space vacated as Douglas-fir or other shade intolerant species die. A typical forest site in the Douglas-fir region, if left undisturbed long enough, would eventually be occupied by an uneven-aged and -structured stand of a shade tolerant species, the most common example being western hemlock. This is referred to as a climax stand because the hemlock can theoretically perpetuate itself unless catastrophically eliminated. Hemlock and Pacific silver fir do not attain the stature of the pioneer species. Hence, the climax forest is reduced in stature and often not as rich in tree species, relative to typical old-growth forests, as a consequence of the loss of the pioneer tree species.1/

Climax forests can be thought of as a special kind of old growth in which pioneer species are absent. The pioneers may have been gradually eliminated over centuries or, perhaps, they were never present; many western hemlock forests along the Pacific Coast reproduce directly following a disturbance. Most commonly, Douglas-fir is present in the young forests in this region, however, and characteristic of the old-growth stands around which the management controversy swirls.

The fact that Douglas-fir is not climax is not a major cause for concern in attempts to preserve old-growth forest, however, certainly not for many centuries! The persistence of Douglas-fir is illustrated at Mount Rainier National Park. Based on investigations made there, over one-third of the plots taken in stands 1000 years in age or more still contained live Douglas-fir. Many of these veterans were in remarkably vigorous condition and persisted until killed by a catastrophic agent such as lightning. Since old-growth forests in Oregon are typically 250 to 500 years old, elimination of the old-growth Douglas-firs is not imminent.

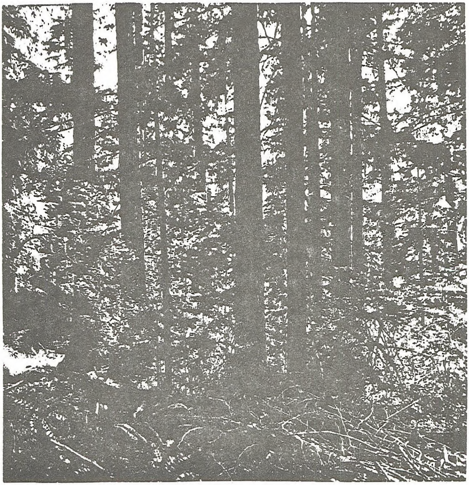
Old-Growth Is As A Complete Ecosystem

An old-growth forest, or any forest, is a very complex system of interlinked organisms and structures with various environmental controls. There is a tendency to focus on individual old-growth components, such as the Douglas-fir trees or northern spotted owls (Strix occidentalis). But it is impossible to really isolate such components; they have too many critical linkages to other parts of the ecosystem; our recent experiences lead us to suspect that most of these linkages are still unrecognized.

1/There are many exceptions to these generalizations. On many forest sites so-called pioneer species, such as Douglas-fir, can reproduce themselves within a forest setting. Warm, dry sites along the margins of the Willamette Valley are an example. Coast redwood (Sequoia sempervirens) is the ultimate example of a large, long-lived species that reproduces following disturbance but also can reproduce sufficiently in forest shade to perpetuate itself indefinitely. Redwood forest is an example, therefore, of a climax forest which is not reduced in stature.

Some general attributes of old-growth forests are immediately apparent to an observer with even a moderate background in natural history (figure 1). Trees typically vary in species and size; some specimens are truly impressive. Trees also vary in color and texture. A multi-layered canopy produces a heavily filtered light, and the feeling of shade is accentuated on clear days by shafts of sunlight and sunflecks on the forest floor. The understory of shrubs, herbs, and small trees is usually moderate, varied in species, and almost always patchy in distribution and abundance. Numerous logs, often large and in various stages of decay, litter the forest floor, creating some travel routes for wildlife and blocking others. Snags are common but often unobtrusive to the casual visitor. The forest is quiet. Few birds or mammals can be heard, except perhaps the melody of a winter wren (Troglodytes troglodytes) or the scolding of a chickaree (Tamiasciurus douglasi). Small to moderate size streams flowing through old-growth forests are shielded from the sun by canopies of adjacent trees. The small and even intermediate-sized streams may have heavy loads of organic debris. Clear, cool water runs through gravel beds behind old log dams and spills into plunge pools. Leaves, needles, twigs, and other organic debris float on the water surface and accumulate in backwaters.

FIGURE 1



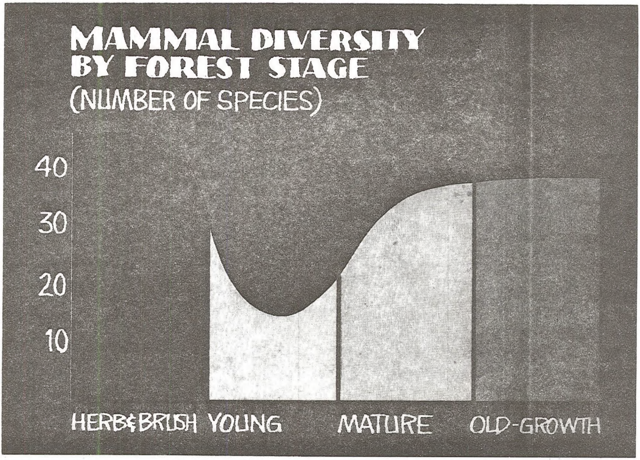
These impressions represent distinctive, important aspects of old-growth forest ecosystems. These aspects are discussed under the headings of organisms (or composition), function, and structural elements which prove to be the major unifying characteristics, as will be seen, and provide for many of the compositional and functional features peculiar to old-growth forests.

Many Organisms Are Found In Old-Growth Forests

Old-growth forests are habitat for an array of plants and animals, some of them strongly associated with this environment. We sometimes use the term composition to refer to the collection of organisms or species found in a forest and diversity to indicate species richness. High diversity indicates that there are many species present.

Old-growth forests in the Pacific Northwest are generally intermediate in species diversity relative to other stages of forest development. The herb and shrub stage is typically the most diverse of the successional stages and young forests are the least diverse. This can be illustrated with mammals (figure 2) but also appears to apply to many other groups of plants and animals.

FIGURE 2



Higher (flowering) plant species determine much of the character of the old-growth forest. There is typically a mixture of three or more tree species including both pioneer (e.g., Douglas-fir) and climax (western hemlock) types. Sizes, colors, and textures of tree trunks are varied as a consequence. None of the higher plants found in old-growth appears to be confined to that successional stage although some plants (such as those that lack chlorophyll but are associated with fungi) may find optimum conditions there. There are also a number of lower plants (mosses and lichens) that are found primarily in old-growth forests. The diminuitive nature of these plants should not mislead us. For example, Lobaria oregana, a lichen that grows in old-growth tree canopies, plays an important ecological role by fixing nitrogen.

Old-growth forests are used as habitat by many species of birds and mammals. The diversity of vertebrate animals is intermediate in old-growth forests (figure 2). Seven birds and nine mammals apparently find optimum habitat in old-growth (Franklin et al 1980) including the northern spotted owl (table 1). Old-growth forest could be essential to the survival of at least some of these species, but this and related questions are unresolved.

Table 1--Vertebrate animals that find optimum habitat for foraging or nesting or both in old-growth Douglas-fir-western hemlock forest ecosystems[1/]

Group	Common name	Scientific name
Birds	Goshawk	Accipiter gentilis
	Northern spotted owl	Strix occidentalis
	Vaux's swift	Chaetura vauxi
	Pileated woodpecker	Dryocopus pileatus
	Hammond's flycatcher	Empidonax hammondii
	Pine grosbeak	Pinicola enucleator
	Townsend's warbler	Dendroica townsendi
Canopy	Silver-haired bat	Lasionycteris noctivagans
	Long-eared myotis	Myotis evotis
	Long-legged myotis	Myotis volans
	Hoary bat	Lasiurus cinereus
	Red tree vole	Arborimus longicaudus
	Northern flying squirrel	Glaucomys sabrinus
Ground mammals	California red-backed vole	Clethrionomys californicus
	Coast mole	Scapanus orarius
	Marten	Martes americana

[1/] On the Olympic Peninsula, fisher (Martes pennanti) exists only in old-growth forests and should be added to this list for at least the peninsula. Habitat changes caused by cutting rather than trapping, are probably responsible for eliminating this species from other sites. (Personal communication from Bruce Moorhead, Research Biologist, Olympic National Park, May 16, 1978.)

Old-growth forests are also gene pools for many widespread and important organisms. Genetically, the common plants and animals found in old growth are essentially present as they have evolved--without human intervention. Douglas-fir is an example. A natural gene pool is represented in the old-growth and other natural stands. The Douglas-firs that are being planted represent a different gene pool, one that has gone through at least a passive selection process different from that encountered in nature (e.g., seedlings grown under nursery conditions). Increasingly, planted Douglas-firs are the result of active genetic selection as part of tree improvement programs. Old-growth forests are, therefore, a potentially useful reservoir of genetic raw material.

Old-Growth Forests Have Functional Characteristics

Function is the work the forest ecosystem does and how rapidly it does it. Functions discussed in this section include productivity (capture, storage, and utilization of the sun's energy), nutrient conservation and cycling, and hydrologic cycling.

Biomass Accumulations and Productivity

The forests of the Pacific Northwest are noted for their productivity--the rate at which they photosynthetically capture the sun's energy and convert it to wood and other organic matter. This organic matter is often referred to as biomass. In northwestern forests massive amounts of biomass (predominantly wood) accumulate as a result of large long-lived tree species such as Douglas-fir and western redcedar (*Thuja plicata*).[2]

---

[2] The reader should carefully distinguish between biomass production, which is often considered on an annual basis, and biomass accumulations or yields, which are the collective result of production over many years or even centuries. Obviously, sites of moderate or even low productivity can accumulate large amounts of biomass given sufficient time and low losses because of death or decay. Similarly, highly productive sites may have relatively low accumulations if the trees making up the forest never achieve large sizes before dying. An example of the first situation are old-growth mountain hemlock (*Tsuga mertensiana*) forests along the crest of the Cascade Range. Red alder (*Alnus rubra*) stands in the Coast Ranges are often examples of the second situation.

It is the very large accumulations of biomass in Northwest old-growth forests that makes them such a valuable resource.[3] Typical values for old-growth Douglas-fir--western hemlock forests in the Cascade Range are 225 to 400 tons/acre with maximal values of 535 to 625 tons/acre. Record stands of Douglas-fir and of noble fir run even higher but all of these are overshadowed by coast redwood forests with biomass accumulations of up to 1,547 tons/acre. Comparable accumulations of biomass occur in few other locations in the world (Franklin and Waring 1980). The average value of biomass in Northwest forests is two to three times greater than average world values of 109 and 142 tons/acre reported for temperate deciduous (hardwood) and tropical rain forests, respectively.

Merchantable wood accumulations in old-growth forests track biomass very closely and net volumes (after deducting defect and breakage from falling) typically run 75,000 to 100,000 board feet per acre (fbm/acre) in good quality old-growth Douglas-fir stands. Yields in excess of 150,000 fbm/acre are not unusual in localized areas, and record groves attain volumes of 350,000 fbm/acre.

Contrary to popular belief, annual productivity is very high in old-growth forests . The massive leaf areas in these forests are optimally displayed to capture the sun's rays and represent a huge photosynthetic factory. Much of this production, often referred to as gross or total production, must be used to maintain the huge standing crop, that is, to "pay" the cost of respiration. It takes energy to maintain living matter, and the larger the accumulation of matter the more energy required for respiration. Hence, relatively small amounts of the gross production are used to produce additional biomass. Nevertheless, substantial amounts of wood production do occur in old-growth forests and typically offset losses to mortality and decay.

Accumulations of live organic matter generally stabilize in old-growth forests as a consequence of the balance between photosynthesis and respiration, growth and mortality (figure 3). Gains tend to offset losses. Two long-term growth studies of old-growth forests are illustrative (table 2). The substantial tree growth recorded in these stands was sufficient to replace trees lost to mortality, which was very high during the period of study because of bark beetle epidemics. There is, of course, some gradual shifting in the wood volume from more valuable Douglas-fir to western hemlock. The general principle of stability in old-growth stand volumes has been known in Northwest forests for decades, however; foresters have often referred to "storing wood on the stump" in talking about old-growth stands.

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[3] All values given are for live aboveground biomass. Live belowground biomass is typically 18 to 20 percent of the total live biomass.

FIGURE 3

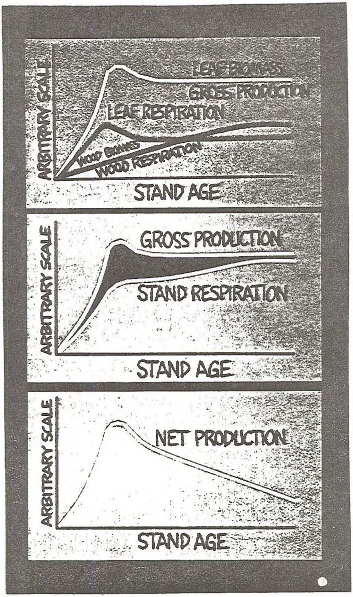


Table 2--Annual growth of two old-growth forest stands in the Cascade Range.

Stand name and age	Period studied	Gross growth	Mortality	Net growth
	--years--	-------board feet/acre/year------		
Tar Creek, 250 years	10	1,582	1,156	426
Wind River, 450 years	12	699	614	85

Nutrient Cycling and Erosion

Large amounts of energy and nutrients, such as nitrogen, phosphorous, and potassium, are represented in the accumulated organic matter (live and dead) of an old-growth forest. Related to this is the development of complex pathways by which this material is decomposed and released. These "detrital" pathways involve a diverse array of organisms including invertebrate animals, fungi, and bacteria. Materials are released slowly and little actually escapes from the surface soil since there are always organisms present to "capture" any freed nutrients and energy from easily decomposed organic molecules. These old-growth forests are identified as being very "conservative" of nutrients because nutrients are tightly retained within the ecosystem. The low level of nutrients and other dissolved or suspended materials in water flowing from old-growth ecosystems reflects this pattern of conservation.

Erosion is also at a low level in old-growth forests (Swanson 1981). In nature, high levels of erosion appear to be associated with infrequent catastrophic events, such as wildfire. But normally, the large and deep root mantles and thick litter layers of the old-growth forest and the numerous logs on the ground surface contribute to low levels of erosion.

As a result of low erosion and low levels of nutrients leaching into the ground water, water quality is typically very high in old-growth stands.

Differences in water yields between old-growth and other stages of forest succession is not completely understood. The herb and shrub stage generally has highest water yields but these tend to rapidly diminish as leaf areas return to predisturbance, forested levels after only a few years. Differences in water yields from young- and old-growth forests are also presently in question. Old-growth forests may have some advantages in precipitating moisture and aerosols from fog and cloves due to the deep crowns.

Stream Functioning

Streams in old-growth "run on leaves and litter", not sunlight. That is, the energy base for these stream systems is detritus (needles, twigs, leaves, cone scales, wood and soforth, which is broken down and utilized by a myriad of aquatic organisms, including bacteria and invertebrates. The invertebrates include a fascinating array of guilds known as shredders, grazers, gougers, scrapers and raspers, collectors, and predators. By contrast, the energy base for streams in open environments is typically algae and other green plants growing in the streams that capture the sun's energy via photosynthesis and become the food base for other aquatic organisms.

Streams in old-growth forests tend to be intermediate among successional stages in productivity, at least in terms of fish and other vertebrates (Murphy and Hall 1981). Provided water quality is not degraded, streams associated with the herb and shrub stage are typically highest in productivity and those associated with young forests are lowest in productivity.

Streams in old-growth are typically intermediate in species diversity between those associated with herb and shrub and with young forest. As with productivity this is largely a consequence of the quality and diversity of food bases available and with the diversity of available habitats. Old-growth stands provide a multilayered canopy of deciduous shrubs and trees and conifers as well as riparian herbs. This contrasts with the closed single-level canopy characteristic of a dense young conifer forest.

Finally, organic debris (particularly logs) is a primary factor shaping the physical structure of streams in most natural forests, including old-growth. Woody debris largely determines the distribution and types of habitats such as pools, dams, and sediment accumulations.

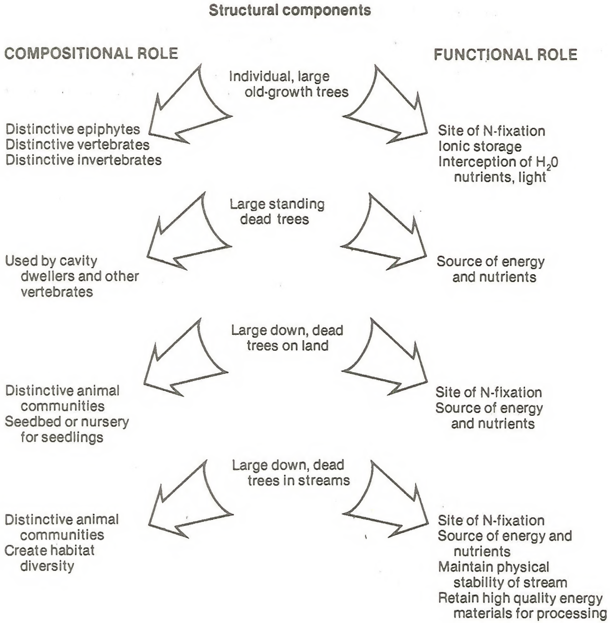
Old-Growth Forests Have Structural Features

Structural features refer to the various objects or structures in a forest, including rocks, logs, trees, bushes, snags, etc. Structural diversity in old-growth tends to be greater than in young-growth forests. There is a larger range in tree sizes, for example, and greater abundance and patchiness in understory shrubs.

Three structural components are of overwhelming importance in the old-growth forest: (1) individual, live, old-growth trees; (2) large standing dead trees or snags; and (3) large down trunks or logs. Logs are at least as important ecologically to the stream as to the terrestrial ecosystem so logs in streams are discussed separately. The live old-growth tree is, in large measure, unique to the old-growth forest. Snags and logs may be very abundant in natural young forests due to carryover from the old-growth stand. The presence of all three structural features distinguishes natural from managed forest ecosystems.

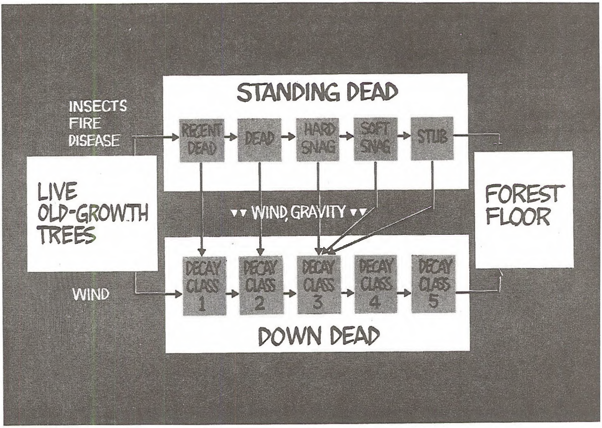
These three structural components are the key to most of the compositional and functional peculiarities of old-growth forest (figure 4). They provide the habitat needed by animal species which prefer or depend upon old-growth forest. They also control the rates at which energy, nutrients, and water flow through the ecosystem.

FIGURE 4


Structural components
COMPOSITIONAL ROLE
FUNCTIONAL ROLE
Individual, large old-growth trees
Distinctive epiphytes
Distinctive vertebrates
Distinctive invertebrates
Site of N-fixation
Ionic storage
Interception of $H_2$0 nutrients, light
Large standing dead trees
Used by cavity dwellers and other vertebrates
Source of energy and nutrients
Large down, dead trees on land
Distinctive animal communities
Seedbed or nursery for seedlings
Site of N-fixation
Source of energy and nutrients
Large down, dead trees in streams
Distinctive animal communities
Create habitat diversity
Site of N-fixation
Source of energy and nutrients
Maintain physical stability of stream
Retain high quality energy materials for processing

An important point is that these structural elements are related (figure 5). The dead organic structures--large tree snags and logs--are derived from the live trees. The large old-growth trees thus play a progression of important roles from the time they are alive through transformation to unrecognizable segments of the forest floor.

FIGURE 5



Live Old-Growth Trees

The most conspicuous of the structural components is probably the live, old-growth Douglas-fir trees. Although their size varies with age and site conditions, diameters of 3 to 6 feet and heights of 175 to 275 feet are common. They are highly individualistic (compared to trees in younger forests), each having been shaped over the centuries by its genetic heritage, site conditions, competition with nearby trees, and the effects of wind, diseases, insects, and mass soil movements. Broken tops and massive branch systems are characteristic. Furthermore, the crowns are often surprisingly deep with live branches extending down three-fourths of the trunk. A single old-growth Douglas-fir tree may have as many as 60 million needles with a total surface area of 30,000 square feet. Needles are well arranged on the deep crowns to intercept the sunlight, including during periods when the sun angle is low (e.g., during the winter). These crowns are particularly affective in intercepting water when fog or clouds blow through the forest. Huge amounts of energy are captured by photosynthesis in these old-growth crowns; but most, as mentioned, goes to maintain the life functions of the tree. Wood increments are small, as is obvious to any who have attempted to count rings on old-growth stumps.

The old-growth trees are very rich biologically. The large, fan-shaped arrays of branches typical of many old-growth trees are particularly important because they become perched ecosystems with organic soil, insects, plants, and higher animals. Trunks, single branches, twigs, and needles also provide habitat for many organisms. As many as 1,500 species of insects and other invertebrates live in the canopy of a single old-growth stand. Some carry out their full life cycles in the canopies while others arrive as adults from earlier growth phases on the forest floor and in streams. Old-growth trees are rich in spiders that prey upon the insects. Vertebrates complete the picture with species such as the red tree vole that lives many generations in a single tree eating Douglas-fir needles and building nests from the remnants. The northern flying squirrel lives in old-growth trees but descends to the ground to feed. The northern spotted owl heavily utilizes both the vole and squirrel as prey.

Mosses, lichens, and other epiphytes (literally plants growing on other plants) add much to the biological richness of the old-growth trees, coating trunks, branches, and twigs. Some of these deserve special mention because of specialized functions they perform. Lobaria oregana, a large lettuce-like lichen found primarily in old-growth forests is an outstanding example. The Lobaria is capable of "fixing" nitrogen, that is, absorbing elemental nitrogen gas from the air and converting it into forms that can be effectively used by other plants fertilizing the ecosystem. Leaching of the lichen during its life and decomposition after its death makes this nitrogen available to other organisms. A single old-growth tree may support as much as 35 pounds of this lichen. On a stand basis, 2 to 4 pounds per acre of nitrogen can be fixed per year, a considerable sum when added up over decades and centuries.

Old specimens of other tree species play roles comparable to old-growth Douglas-fir, but they have not been as thoroughly studied as Douglas-fir. Sitka spruce attains comparable size in coastal regions; deep crowns and heavy epiphyte-laden branch systems are characteristic of older specimens. Noble fir and western white pine (Pinus monticola) are subalpine species with some of the characteristics of Douglas-fir as is sugar pine (Pinus lambertiana) on dry sites in southwestern Oregon. All of the so-called cedars--western redcedar, incense-cedar (Libocedrus decurrens), Alaska-cedar (Chamaecyparis nootkatensis), and Port-Orford-cedar (Chamaecyparis lawsoniana)--are capable of attaining sizes and fulfilling roles comparable to Douglas-fir in their respective forest types. Cedars also have the additional advantage of fostering improved soil conditions through their nutrient-rich litter.

Large Snags

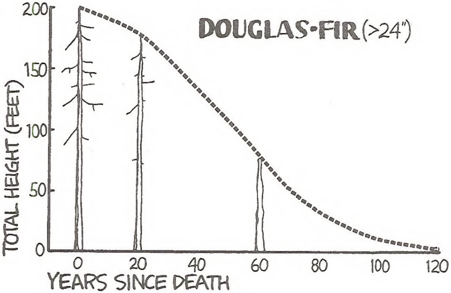
All natural forests have standing dead trees or snags as a major structural component. In young forests, they are typically carried over from the catastrophically destroyed forest that previously occupied the site. Snags are abundant in old-growth forests and form continuously as trees die from various causes (Franklin et al. 1981).

The primary role of snags is provision of habitat for wildlife. They are the primary location for cavities created and used by many species of birds and mammals. In the Blue Mountains of eastern Oregon, 39 bird and 24 mammal species use these sites for nesting and overwintering, as food sources, and for other functions (Thomas 1979).

The large hard snags required by primary excavators such as the pileated woodpecker (Drycopus pileatus) are especially important for wildlife. These snags are difficult to perpetuate in managed stands but are critical to certain species and yield smaller, soft snags through the decay process. In western Oregon, larger snags have greater diversity and more hole-nesting birds than smaller snags (Mannan, 1980). There are also indications that the number of snags is a limiting factor for cavity-utilizing vertebrates; larger numbers of snags have been correlated with greater numbers and higher diversity of such species.

Snags gradually disappear through various decay processes (Cline et al. 1980). Even the largest Douglas-fir snag is relatively short-lived (figure 6) and last a maximum of 100 to 120 years within a forest (Graham 1981). Snags left in an open area (e.g., burn or clearcut) disappear even faster. Other factors affecting the pattern and rate of disintegration of snags include tree size, species, and incidence of rot at the time the tree dies. A Douglas-fir snag under 16 inches in diameter completely disappears in 40 years or about 2-1/2 times as fast as one over 24 inches in diameter. Western hemlock disintegrates much faster than Douglas-fir while western redcedar is the most persistent.

FIGURE 6



Large Logs

Down dead trees or logs are a major structural feature of natural forests at all stages of successional development. As for snags this is because most catastrophes that kill forests do not consume or remove large amount of wood. This is well illustrated by the weak correlation between stand age and amounts of woody debris (snags and logs) found in one sample of stands that ranged from 100 to over 1,000 years of age; largely because of carryover from the predecessor old-growth stand, many young forests had as much dead wood as the sampled old forests.

Large masses of down logs are characteristic of old-growth forests. Typical concentrations are 40 to 85 tons per acre with up to 188 tons recorded for some intact stands. Logs generally cover 10 to 20 percent of the ground surface in old-growth stands. These logs represent major pools of energy and nutrients which are slowly made available as the logs decay. They also play many important ecological roles within the old-growth forest.

Down logs provide essential habitat for a variety of invertebrate and vertebrate animals. Wildlife utilize logs as food sources, as nesting sites, for protection and cover, and as lookouts. High moisture content of logs makes them especially important to amphibians. In the Blue Mountains, logs are utilized by 49 mammal, 115 bird, and 14 amphibian and reptile species (Thomas 1979). The persistence of large logs, especially through major catastrophes such as wildfire, has special importance in providing wildlife with structural or habitat continuity. Logs also contribute to animal reinvasion of severely disturbed sites such as clearcuts and burned areas by providing protected pathways. This may be important in ensuring reinoculation of these sites with spores of fungi that are beneficial to the growth of the new forests; small mammals are the primary means for dispersal of these spores.

Logs serve as sites for reproduction of tree species, especially western hemlock. This is an important function in natural stands since these seedlings and saplings provide replacements as openings appear in the overstory canopy. The phenomenon of "nurse logs" reaches its peak in the coastal Sitka Spruce Zone where reproduction of tree species is essentially confined to rotten logs (figure 7).

FIGURE 7

Other functions of down logs are as sources of energy and nutrients, sources of soil organic matter, erosion-reducing structures, and sites for nitrogen fixation (Franklin et al. 1981). The recently discovered bacterial fixation of nitrogen in logs provides yet another pathway by which the nutrient requirements of the forest are met. This also adds to the pool of nitrogen in forms that can be used by plants.

Like snags, logs go through recognizable stages of disintegration (refer to figure 4). One system recognizes five log decay classes defined by physical characteristics ranging from freshly fallen (class 1) to highly decayed and barely recognizable material (class 5). Important physical and chemical changes are associated with the progress of decay, including a rapid early increase in moisture content, gradual increases in the concentration of nitrogen, and gradual reductions in wood density (Triska and Cromack 1980).

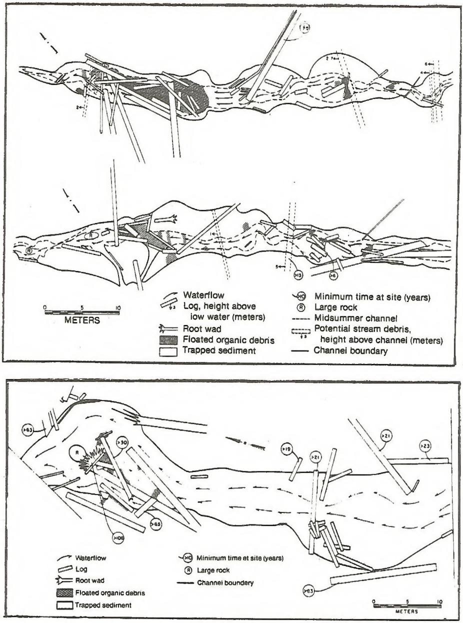
Logs persist much longer than snags of equivalent size. Large Douglas-fir logs can remain identifiable (although greatly reduced in volume and density) for over 240 years whereas snags reach comparable decay states in one-third the time. The activity of animals (invertebrates and vertebrates) and effects of gravity are believed to be factors in the more rapid demise of snags. Species differ substantially in log decay rates. Western hemlock and true fir (*Abies* spp.) logs decay many times more rapidly than Douglas-fir logs. Cedars and coast redwood are most resistant to decay.

Large Logs in Streams

Logs and other woody debris are conspicuous elements of small- to medium-sized streams flowing through old-growth forests (Swanson *et al.* 1976; Swanson and Lienkaemper 1978). They are typically very stable structural devices because of their large size relative to streamflow and because they are often anchored to adjacent land surfaces by their root wads. Their dominance of both physical and organic aspects of the stream ecosystem is reflected in the many critical roles played by logs in old-growth and other natural forest ecosystems. Woody debris largely controls the type and distribution of aquatic habitat, stability of streambeds and streambanks, routing of sediments and water through the stream system, and retention of the energy base of the aquatic ecosystem.

Aquatic habitats created by woody debris include sediment accumulations behind and plunge pools below debris dams as well as the woody debris itself. The amount of wood-related habitat does vary with local conditions and the size of the stream (figure 8). Commonly from 1/4 to 1/2 of the habitat is wood or wood-created in small streams within natural forests. Obviously, the wood-related habitat diversity contributes directly to species diversity and makes stream ecosystems richer in whole classes of organisms than would be the case in the absence of woody debris.

FIGURE 8



Large woody debris produces a stepped profile in streams resulting in dissipation of much of the stream's energy through waterfalls or cascades. This pattern of dissipation reduces the energy available for erosion of streambeds and banks, allows for greater sediment storage in channels, and produces greater habitat diversity than in straight, even-gradient channels.

Woody debris in streams is a major source of energy and nutrients for the stream ecosystem. Although woody materials are processed slowly, relative to leaf litter, huge quantitites are available and are utilized by various groups of microbiological and invertebrate organisms. In addition to the nutrients contained in the wood, woody debris is also a major site for nitrogen fixation within the stream ecosystem. In one study, 52 percent of the total input of nitrogen into a small stream was associated with wood.

One of the most important roles of woody debris in small forested streams is as a retention device which traps leaves and other litter until they can be utilized by stream organisms. The energy or food base for small streams in forests includes leaves, twigs, and other inputs of organic matter from the surrounding land. Much of this input occurs during a relatively short period in the fall. Also, much of the material has to undergo a period of "preparation" or colonization by microbes before it can be utilized by many of the invertebrates. These, in turn, provide the food base for vertebrates, such as fish. Biological activity in the stream is at its peak in the winter when streamflow is highest.

Structural devices such as debris dams are critical for holding the food base within the reach of stream until it has been prepared and can be processed by various organisms. Without such devices, leaves and other litter would be flushed down the stream and onto floodplains before aquatic organisms could use them. Although logs and other woody debris are not the only stream structures that serve a retention function, they are of overwhelming importance in smaller streams within natural forests in the Pacific Northwest. Without such structures, the composition (of insect and fish species and productivity of streams are very different and much simplified from the natural state.

Coarse woody debris also plays important roles in larger streams and rivers flowing through natural forests but these are somewhat different roles than in smaller streams. One key difference is the ability of large streams to move the debris and accumulate it on banks at high flow. Studies on the South Fork of the Hoh River in Olympic National Park, Washington have identified several roles for woody debris, including formation of protected off-channel habitats that have very high species diversity and biological productivity (Franklin et al. 1980).

On Ecological Characteristics of Old-Growth Forests: A Conclusion

Our knowledge about the structure, function, and composition of forest ecosystems is extremely rudimentary, and this applies to young- as well as old-growth forests. Forest science has often taken a narrow view in attempting to resolve current management problems. It is astonishing to find how little basic information exists on such fundamental topics as: root production and turnover; amounts, distribution, and dynamics of woody debris; and crown structure of trees of all sizes, ages, and species. Recent research reminds us of the magnitude of our ignorance: root systems may require 50 to 60 percent of the food produced by a tree (photosynthate) for maintenance; much of the photosynthate (even a majority on some sites) is produced during the non-growing-season period of fall, winter, and early spring in the Pacific Northwest; off-channel aquatic habitats function as biological hotspots in mountain river valleys; and so forth. The numbers and implications of recent findings on forest ecosystems should certainly humble us enough to consider seriously the maintenance of much ecological diversity and as many management options as possible.

It is clear from this paper that we do know some important things about the ecological characteristics of old-growth forests. These forests are distinctive and neither decadent, unproductive ecosystems nor biological deserts.

Old-growth stands do differ markedly from young-growth forests and, particularly, managed forests. Differences between natural young- and old-growth forests are reduced because of woody material carried over from the old to the new forest as snags and logs; such structures will not be present in managed young-growth stands except by management design.

Old-growth forests do have some unique or special values. Some terrestrial and aquatic organisms are provided with specialized habitat requirements. Gene pools of both common and unusual species are perpetuated. Biomass is maintained at a high plateau. Streamflow is well regulated. Water quality is generally very high as a consequence of low nutrient leaching and low rates of erosion.

These, then, are some of the attributes and values associated with the old-growth forest ecosystem.

Management Options For Old-Growth

There are several alternatives by which we can attempt to manage for old-growth ecosystems or attributes: (1) retain examples of existing old-growth forest; (2) recreate forests with old-growth characteristics by using long rotations; (3) manage for individual attributes (e.g., snags) on lands subject to intensive forest management; and (4) substitute artificial structures to serve functions previously provided by old growth.

Preservation of exemplary old-growth forest stands has been going on for many decades in the Pacific Northwest. Old-growth forests are protected, for example, within National Parks, wilderness areas, and Research Natural Areas. Strictly preserved sites of this type are limited in number and often poorly distributed geographically. Change in these old-growth forests is so slow that we need have little concern about the loss of characteristic elements, such as the Douglas-fir.

Recreation of old-growth-type forests on long rotations is theoretically possible. It would appear that we have sufficient knowledge of old-growth characteristics and silvicultural systems to accomplish such a goal. The final proof will, of course, be sometime in coming.

Some general management guidelines for preserving or recreating old-growth forests appear appropriate. Blocks of land of several hundred acres appear necessary to maintain the integrity of the forest although minimum size will vary depending upon management of surrounding lands. Small drainages may be ideal as management units because of the distinctive and protective nature of their natural boundaries (ridges) and the inclusion of the stream as well as the forest. Streamside and roadside corridors may be particularly valuable as old-growth reserves because they provide protected and continuous travel routes for migraton of plants and animals over the landscape. Salvage of large snags and down logs is not appropriate in sites for old-growth or long-rotation management since these structures are keys to the composition and functioning of old-growth ecosystems. In fact, the best management practice for reserved old-growth stands is no entry at all. This may create problems along roads. Use of streamside corridors for old-growth or long-rotation management has the added advantage of allowing the perpetuation of a natural stream structure including woody debris.

Some individual old-growth attributes can be incorporated into schemes for intensively managed forests. Examples include provision for snags and logs within managed stands on rotations of 40 to 100 years. Such structures can greatly augment the ecological diversity in these forests which will, after all, occupy the bulk of our commercial forest land here in the Pacific Northwest, regardless of what is done with the remaining old growth. Learning to manage dead wood as cleverly as the live tree will require creativity on the part of silviculturalists.

We might consider substituting artificial for the natural structures provided by old-growth and other natural forests. Construction of gabions in streams and using bird houses in place of snags are examples. This approach is expensive temporary, and incomplete. Perhaps more important, managing for individual attributes or substitute structures does not provide for an integrated natural forest ecosystem.

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Figure 1. Old-growth Douglas-fir--western hemlock forest showing diversity of tree sizes and characteristics of the understory.

Figure 2. Mammal species utilizing various successional stages as primary habitat.

Figure 3. Trends in biomass, productivity and respiration in relation to stand age; note increasing respiration and declining net production with age.

Figure 4. Relation of structural features to compositional and functional attributes of old-growth forest.

Figure 5. Routing of tree stems from live through various dead organic compartments; many pathways are possible.

Figure 6. Disintegration of large Douglas-fir snags in stands in relation to time.

Figure 7. Decaying logs are important habitat for the reproduction of tree species; this "nurse log" has seedlings of western hemlock, western redcedar and Sitka spruce.

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ECOLOGICAL ASPECTS: Response by Dr. Olof C. Wallmo

MANAGING FORESTS TO RETAIN THE WILDLIFE HABITAT CHARACTERISTICS OF OLD GROWTH*

Dr. Franklin's synopsis of the ecology of old-growth forests deserves recognition for representing an outstanding accomplishment in ecological science. This conference also should recognize that his review is based largely on research results published since 1970. Although the U.S. Forest Service and the timber industry have long advocated the liquidation of old growth on the National Forests, we have only recently acquired enough knowledge to consider the wisdom of that policy from an ecological standpoint.

Much credit for the present understanding of old-growth coniferous forests as ecosystems is due to the Coniferous Forest Biome project of the International Biological Program. IBP was launched less than 20 years ago by ecologists around the world with the goal of learning enough about the world's biomes to use and manage them judiciously. In this conference it is appropriate that we recognize, first, the role that Dr. Franklin played as an administrative and intellectual leader of the Coniferous Forest Biome project and, second, that he and his colleagues are still pursuing its important goals.

It is also important in this conference to realize that there must be some old growth left for the knowledge presently available and still to be acquired to have practical relevance to management. What little is left, perhaps 2 percent or less of the commercial timberland base in the United States, occurs largely on National Forests and a small amount on Public Domain, under the Bureau of Land Management. Thus, we own it, and the agencies that manage or mismanage it are constrained by law to consider all of our interests in their stewardship. That caveat is made so that the following comments on wildlife ecology have relevance to management philosophies, policies, and practices applied to the land where most of the old-growth occurs--public land.

To Dr. Franklin's ecological view of old-growth forest I would only like to add emphasis to the dimension of time. In each of the spatial dimensions --height, from the soil to the topmost branch; breadth and depth, across ridges, bogs, streambeds, and up the mountain slope--characteristics of the forest result from conditions operating over time. Old-growth forests are 4-dimensional.

Over time, centuries, the forest becomes increasingly heterogeneous in the vertical dimension, and there is an increasing array of habitat niches to accommodate an increasing variety of ground plants, epiphytes, invertebrates, birds, and mammals. Over time, heterogeneity also increases in the horizontal dimensions. The array of niches available to worms, beetles, voles, marten, fishers, weasels, bears, deer, thrushes, wrens, and grouse grows wider. Thus, in very old forests vertical heterogeneity is complexed by horizontal heterogeneity. Over large areas, thousands of acres, the old-growth forest offers a multifarious mosaic of plant and animal habitats. Centuries are required for the fullest expression of that complexity. For example, W. D. Billings estimated that it takes 6-7 centuries for the subalpine forests in the central Rockies to become dominated by 300-500 year old spruce and fir.[1]

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* Prepared paper.

Ecologists have attempted to reduce the mind-boggling complexity of such habitats to comprehensible quantitative expressions of "ecological diversity." Their limited success is adequate testimony of the formidability of the effort. Foresters often speak of increasing diversity by converting old-growth forests, which they think lack diversity, to a patchwork of even-aged second-growth stands of different ages up to about 100 years, each of which is homogeneous and most of which are very similar in poverty of wildlife habitat. Suffice it to say they are misguided.

Dr. Franklin's discussion of management options includes one of recreating old-growth type forests through long rotations. His chronology of the approximate stages of development of forests takes 2 centuries to the beginning of the old-growth stage. A forest that started when Vancouver first saw the northern Pacific Coast would not be approaching that stage. It will take additional centuries for full expression of the characteristics described by Dr. Franklin. The forests that were logged when Weyerhaeuser moved in will be entering the old-growth stage when your great-great-great-great-great-grandchildren are looking for a place to hike and camp and listen to bird songs.

John Mundinger recommended a harvest rotation of 250 years to provide for the needs of white-tailed deer in the Swan Valley of northwestern Montana.[2] Jack Ward Thomas and others suggest 240-year rotations to accommodate pileated woodpeckers in the Blue Mountains of Oregon.[3] Interim pre-commercial and commercial thinnings were proposed to foster development of a good woodpecker forest. After economic maturity the forest would stand silviculturally idle for more than a century. Within the total managed area, the small percentage in that age range would be suitable for woodpeckers, or deer, for a few decades, then be cut down. If such proposals were to withstand a thorough evaluation of potential ecological gains and economic costs, and initiated, and actually carried out, they would begin to bear fruit about when the U.S. is twice as old as it is now. So, we could forget about old-growth forest as a renewable resource for generations.

Another option mentioned was managing for individual attributes of old-growth forest. Tongass National Forest in Alaska tried that with eagle nest trees. Selecting healthy, young hemlocks in 20 year old stands, they cut away surrounding competitors and fertilized the future eagle trees. Then they planned to return 10 years later and shoot the tops off the trees to start developing a deformed crown to support a nest. After that, I

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1. Vegetatio, 1969.
2. Montana Department of Fish, Wildlife and Parks, Montana Deer Studies, 1980.
3. U.S. Forest Service, Wildlife Habitats in Managed Forests, 1970.

guess, they would have sat back and proudly waited a couple of centuries to demonstrate the results, if the public and press had not embarrassed them into dropping the project.

Tongass National Forest also has a policy of not logging within 100 meters of an eagle nest. The U.S. Fish and Wildlife Service discovered that, among several hundred such nests so protected, more than half of the buffer zones suffered blowdown averaging 60 meters in width within a 5-year period. It seems unlikely to me that many nests would survive a 100-year timber rotation. And, there would be no replacement of suitable nest trees in that time. Under such a management concept, eagle nest trees would be a non-renewable resource.

Leaving large snags in clearcuts has been a suggested management practice for preserving habitat for cavity-using birds and mammals. Large snags have a life expectancy of adequate height and diameter for such habitat of perhaps half a century. So, snags left in second-growth forests will be gone before rotation age, and there will be no replacement. In old-growth forests, in contrast, snags are continually disintegrating and being replaced over the centuries. Logs on the forest floor, which contribute to the habitat of many vertebrate species, present a parallel management problem. These attributes are non-renewable habitat features, in any practical sense, under management.

Creating a desirable understory could be another dilemma in managing for individual habitat attributes. For example, in southeast Alaska it takes about 150 years after crown closure for significant populations of the forage plants most important to deer to begin to become re-established. Once established, however, they continue in the old-growth forest forever. Even if we were to learn how to accelerate their establishment in secondgrowth forests, their existence would be relatively brief, and the process would have to be repeated with each rotation. It is difficult to conceive of that understory as a practically renewable resource under even-age forest management.

Recent studies of old-growth ecosystems in the Northwest reveal their special contributions to habitat for black-tailed deer, white-tailed deer, mule deer, elk, blue grouse, marten, mink, fisher, river otter, bear, spotted owl, goshawk, Vaux's swift, pileated woodpecker, and even such unexpected species as Canada geese and ancient murrelets. The list goes on; it should not be surprising that the fauna of a forested region would be specifically adapted to its natural vegetation, justs as pronghorns, plains bison, prairie chickens, and lark buntings were best adapted to virgin prairie. "If animals living in the wild are to thrive they must make very specific demands on their environment."[1] To develop silvicultural strategies for efficient growth and harvesting of timber while preserving attributes of old-growth forest that are important to very many of these species would seem a formidable goal. Today, however, it is important to recognize that we have begun to learn about wildlife-old growth relations but have not acquired empirical experience nor initiated experiments to provide guidance for such management efforts.

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1. Konig and Gossow, in The Ecology of Even-Age Forest Plantations, 1978.

How little we know was impressed on me when I realized that for one of the most widely researched kinds of wildlife, deer, we hadn't the foggiest understanding of habitat values of old-growth forest. As a Forest Service wildlife ecologist, I was assigned in 1976 to research on relations of timber management to wildlife habitat in southeast Alaska. My co-worker, Dr. John W. Schoen of Alaska Department of Fish and Game, and I soon discovered that the black-tailed deer there used old growth preferentially and made sparing use of clearcuts and even-aged second-growth timber. Young clearcuts provided forage but were too dense for extensive use in summer and usually too deep in snow for any use in winter. We also found that habitat conditions for deer tended to improve with increasing tree size and timber volume in old-growth stands. The most attractive forest for logging appears to be the best deer habitat.

Timber industry and Forest Service officials derided those findings in Alaska because, traditionally, everyone "knew" that mature forests were bad for deer and logging was good. In re-examining the basis for that tradition, we discovered that there is no good basis for it as a generalization. High deer populations apparently occurred in virgin forests of the Northeast, Southeast, Lake States, South, and Pacific Northwest in pre-logging times, and low populations occurred after logging. Deer populations recovered in some areas, but usually after years of protection from hunting and predation.

While the best information on values of old growth as deer habitat comes from Alaska, British Columbia, and Montana, the principles apply more widely. The only explanation we can offer for the fact that these qualities were not recognized earlier is that most of the theories on deer and forests were developed in the East after the virgin forests were gone. Generally, the concept of "mature" forests being poor deer habitat seems to be based on the paucity of deer in the second-growth forests.

Two additional management options were listed by Dr. Franklin. One was to preserve old-growth forests and the other to do without. As a realistic ecologist who has studied changes in vegetation and faunas of the biosphere over geologic time, I think we can do without, providing that sometime in the near future we learn to take only as much from the earth as it can return. As a member of a society who ponders the question of who and how many benefit from the decimation of natural resources, I think it is in the general interest to preserve the remaining old-growth forests. Constituting such a small percentage of the remaining commercial timberland in the United States, they may be more important to present and future generations for their recreational, esthetic, educational, and scientific value than they are to the wood-products industry that has the remainder for demonstrating their ability, or lack of same, to manage forest lands for sustained production of all the products that are valued by society.

One management option not mentioned by Dr. Franklin was uneven-age systems with highly selective single-tree or small-group removals. The potential of such systems to retain desirable wildlife habitat and ecological characteristics is demonstrated in old-growth stands in Alaska that were high-graded early in the century. It was economically practical then, or it would not have been done. Now, it is impractical under the economic philosophy of reaping maximum dollars from the accumulated volume in old growth, then converting it to maximally dollar-productive wood lots. But, if society places a high value on old growth for other reasons, this management option might keep it intact while permitting limited exploitation for timber.

Silvicultural and ecological objectives, logging methods, transportation and marketing problems, and social and economic benefits and losses would have to be considered in planning such management schemes. But, the important point is that we can try them on a limited experimental basis without sacrificing the entire resource. L. S. Minckler emphasized that "foresters should be able and willing to take on the management of nontimber forests for the environmental values."[1] In the meantime, the timber managers have 400 or 500 million acres of the U.S. on which to demonstrate what they can do for wildlife and other values under more productive timber management systems.

There is a myth that old-growth forests will suddenly collapse and be wasted if we don't harvest them now. They won't, unless radical changes suddenly occur to the earth's environment. If such changes don't occur, the forests will remain for us to learn how to manage them in the overall interests of mankind. If such changes do occur, you can tell me we should have taken it when the taking was good. Then what?

Dr. Franklin listed the management option of substituting artificial structures for the essential habitat features provided in old-growth forests. At Disneyland in California and Disney World in Florida this has been done artistically, but more practically by also substituting artificial animals. However, documentary films might be a still more practical substitution that we could offer for posterity.

For this conference to offer an honestly balanced perspective it should consider the probability that any effort to exploit then re-create old-growth forest ecosystems will fail to restore their original ecological identity within the foreseeable future.

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[1] Journal of Forestry, April 1980.

ECOLOGICAL ASPECTS: Response by Dr. Jack Ward Thomas*

One of the points I'd like to make relates to the question "Why are we particularly interested in old growth as it relates to the animal kingdom?" I think in the long run the answer is probably going to come down to the word "diversity," a word that has been used a great deal lately. But why would this be true?

Some simulation of a natural forest, I think, will exist up to old growth. Why not old growth? Because we would intentionally cut off or truncate the successional pattern at that point, since it would be financially feasible. If we are practicing intensive forestry we want to produce as much wood as fast as we possibly can. That's only economically rational.

That means there would be two successional stages with which we would have particular concern. First would be the early successional state which looked important in terms of the number of species supported. I'm not particularly concerned about the early succession state. I think we'll be making enough early succession and we have enough trouble getting the trees to do what we want them to. So I'm really not worried about that one.

When we get to the edge of the old growth group, we would truncate that succession because the forest would not be laying on wood fast enough to maximize economic returns. Probably the entire key to some type of diversity in a managed forest will be the provision for old growth.

Now, what's the state of knowledge about old growth? Dr. Wallmo put it very well. Our information is very slight and it's very recent. It's improving faster than it ever has in the past, but, obviously, improving at too slow a rate to answer the political demands and pressures that are on us right now.

To slide from biology into something akin to political comment, I've argued in enough meetings "how" or "why" or "if" we should manage old growth. If we had all that research money, we might be able to provide some of the information that we really need instead of arguing continuously about what we don't know.

While researchers always think that we need more research, in this case we are engaged in a multi-million dollar debate, probably a billion dollar debate, about old growth manipulation and management. From the scientific view we are undertaking that debate with a totally inadequate knowledge base. We don't know the answer to many of the things we are arguing about, and we're not making much of an investment to find out the answers we need.

I've another comment for the discussion that follows. I think we'll evolve into an emphasis on species. What about, for example, the spotted owl? The spotted owl has been the thing that perhaps has focused our attention on the pacific northwest old growth as a different kind of habitat. In my mind, it's a surrogate, something that stands for something else. What I think it's saying is that we should consider the old growth community and what its attributes are and decide if we want to continue them during our existence.

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* Transcribed comments.

Dr. Franklin, in essence, talked about micro-ecology, the internal mechanisms of old growth stands. I want to talk a minute about macro-ecology. If we decide to maintain islands of old growth within the managed forests, we would need answers to macro-biological questions. In other words, if we manage old growth we must start with existing stands of old growth. It takes a very long time for trees to be 250 years old, and we have not demonstrated our ability to manage old growth. I agree with Dr. Franklin that it should be theoretically possible. Yet I also agree with Dr. Wallmo. The time span reminds me of sitting in the Continental Congress in 1776 on the forest policy committee.

We have to start with existing old growth and deal with that as a basis for any type of old growth management policy, if we choose to institute one. We're going to have to answer questions like: "How big should old growth stands be?" "How should they be distributed?" "Should they be connected by corridors."

There is a body of scientific theory, usually more theory than tested hypotheses, dealing with the relationship of species to area, of immigration versus extinction rate. In other words, when you have an island type of situation, species within that island are constantly going extinct. This situation depends on immigration from other areas and results in a species equilibrium. There is a lot of ecological argument about that concept, but there is not much argument that an extinction rate exists, coupled with an immigration necessity.

Stand sizing is going to be a critical question, both in terms of the stand's ability to maintain its integrity and on how big that stand must be to serve the management objectives.

Finally, we have the corridor connections and the idea of old growth as an island in a surrounding sea of forests--except that it's not a steady-state sea. The surrounding sea is going to constantly change: different ages of trees, different compositions, different structures. We know very little about that.

Again, as a true researcher, I'd like to conclude with the thought that research is very desperately needed. If we could get on with it, we might be able to have a more sensible debate.

ECOLOGICAL ASPECTS: Response by Dr. E. Charles Meslow*

I think perhaps as an opener it might be worthwhile to mention a few more of the wildlife species involved in this westside, Douglas-fir, old growth ecosystem. We've already heard quite a bit about the northern spotted owl and should add the goshawk and bald eagle. Certainly the pileated woodpecker is an important vertebrate component. How about some mammals? We've got them too: the red tree vole and the flying squirrel, both of which are important prey items of the spotted owl; the marten; and a number of bats, for instance, the silver-haired bat.

The sorts of information that forest managers need (and it's up to us as wildlife biologists to provide) fall into three different categories when we must manage old growth with respect to wildlife. We need to understand the habitat requirements of specific species involved. We need to know how many of a species are required for an area. In other words, what constitutes a viable population? As Jack Thomas mentioned here a moment ago, we need to come to some understanding of how we wish to have these forests and their attendant animals distributed.

The habitat needs of some wildlife species are relatively well worked out. I think those of you who had the opportunity to attend the poster session last night were able to look at examples of some of the species we know something about. Again, this information is all very recent. We need more of it, and we'd like to refine it. But we do have a handle on the number of species.

The old growth habitat needs of some animals are quite specific. For instance, both the bald eagle and the goshawk need nest areas, nesting groves if you will, of old growth. The pileated woodpecker needs a component of old growth. The woodpeckers use snags--the larger the snag the better. So there's a particular structural component of old growth that can be managed for.

There are some species, the spotted owl and its prey are probably the best examples, that require old growth for a variety of needs, and they can't be satisfied with just a small portion. Their whole range, or an adequate portion of their range, must be in old growth.

"How many individuals is enough?" is a common question. We face it all the time as wildlife managers in trying to respond to the allocation of expensive forest to house animals. "How many must we have?" That's a very difficult question. It's highly theoretical. We turn here to get help from population geneticists. They're not unanimous on the question. It's very difficult.

There seems to be a thread of commonality for a minimal number of animals--about 500. That seems to be a viable population level over a fairly long period of time. This number provides some insurance. If there were any fewer, the likelihood is that genetic variance would be lost at a rate faster than rotation could replace it.

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* Transcribed comments.

ECOLOGICAL ASPECTS: Response by Dr. Robert Vincent*

I wish in no way to have my comments reflect upon the excellent presentation that Dr. Franklin gave, nor upon the distinguished panel of scientific colleagues here. Please accept my comments as scientific observations, as tongue in cheek thoughts to stimulate your thinking, or perhaps as feeble satire.

Let me, for example, tell you that I took a walk yesterday, and that I walked in a place that was quiet, dimly lighted, a site of high nitrogen recycling. It was cool and green, and there was an atmosphere of death and decay. It was isolated. There was much decomposition, little animal activity, little human activity. No, I wasn't walking in on old growth forest. I was walking in a cemetery. There are similar characteristics when you stop to think about it. Recall how Dr. Franklin pointed out that two of the three dominant visual characteristics of an old growth forest were dead: dead snags and dead logs on the ground.

Even the living trees are partially dead--dead tops and dead limbs. Truly, an old growth community is a community of the dead. There are many saprophytic plants that live off of the dead organic material, particulary down at our level, because of limited sunlight.

There is a tremendous bio-mass, as was brought out: dead wood, leaves and litter. Yes, even the streams, as Dr. Franklin pointed out, are dependent on, not the sunlight, but dead leaf and litter-fall for their nutrient source. And they are dependent not on living trees to give them the stair-step configuration to form pools and channels, but on the dead trees that fall.

As rightfully can be expected by a community that is dominated by death, an old growth community contributes little to other communities. It has little net output, as was mentioned. It has nothing to export. It's a third-world country, in other words.

Let's look at a couple of examples. Much accumulated wood has been mentioned in regard to an old growth stand. Maybe we should think of a self-centered miser who has inherited millions. What does he do? He goes out and buries it in Crisco cans. Sure, it's there, it's safe, it's a lot of dollars. It's not leaking out. He's not losing it. It's not helping anyone. And it's not increasing or compounding. He can take it out and look at it if he wishes to. Perhaps he gets some real enjoyment out of this. He can even gloat over it.

Let's look at perhaps an even more appropriate example--a poorly managed bank. The balance sheet always remains at $400 million. The bank has a tremendously high income. That is the photosynthesis up there in those 60 million needles. The bank has a tremendous amount of assets. There's a lot of bio-mass, a lot of wood, a lot of debris. But at the same time, the bank also has tremendously high expenses: the respiration, the decomposition, the organic breakdown. So the result is that the bank has just enough income to pay expenses; it is gaining just as much as it loses.

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* Transcribed comments.

On the other hand, there are some people who really enjoy old things. The unchanging, the stagnant, the dying. In fact, we almost seem to live in an era of ancestral worship of things. Where do people go to make a visit? Certainly not to Houston or Denver, but to Rome, Venice, Paris and Brussels where they can see old cathedrals and stagnated cities that haven't been touched for years. In fact, the longer a city stagnates or the longer a ruin stands, the more beautiful it becomes. It's kind of ridiculous, isn't it?

The Parthenon in Athens, for instance, was not even recognized as an object of beauty until 1,800 years after it was constructed. By then it was just a remnant of a ruin. And now millions of people go to visit it and marvel at what is left of what was once a beautiful structure. I suppose that if we could preserve an automobile junkyard for 1,000 years, it might be considered a thing of beauty.

Old growth forests are different. It all depends on how we look at them. But they are old, and they do function on death and dying. They are ecosystems built on functions of death: complex, different, and unusual ecosystems that contribute little to others and are extremely self-centered in that they care only for themselves and no one else.

Some people like the old and the stagnant. Some people like the ruins. Perhaps some like the life-to-death or the death-to-life cycle, if you wish to look at it that way. Some of us even like to read epitaphs on tombstones.

We need older forests, but only so much of them, for they fill a limited function, as does a cemetery. Although a cemetery serves all of us, the area needed per client is small.

ECOLOGICAL ASPECTS:
Responses to Questions from the Audience*

What are the minimum needs in terms of percentage and distribution to meet minimal wildlife needs? We need this answer now for forest planning. How about a professional estimate?

THOMAS: What's the minimum need for the minimum wildlife population? First, I'm not even sure that I like the question. The answer to that is, "nobody knows." I'm also prepared to say that we're going to have to make some management decisions. Yes, we should participate in that, but there's no way in the world I can stand here and tell you what that is.

The question is not finely tuned enough. "What are the management objectives?" "Is it a diversity objective." "A species oriented objective?" "Is it deer or spotted owls, or is it species richness?" The question has to be more finely tuned. I don't think anybody on the panel can stand here and tell you what the answer is. I think we can struggle and come up with an answer, but I'm not sure how reliable it would be.

If an old growth forest is a closed and self-sustaining system, don't we run the risk of decreasing the productivity of a given site under intensive management over several centuries in the absence of external inputs such as fertilization?

FRANKLIN: Again, the answer is, "we don't know." A professional judgment would be: on some sites definitely, on other sites probably not. It depends on the circumstance. I still find myself astonished by Dr. Vincent's analogy. I will point out that a selfish system is the one that takes from the site on a repeated basis and returns nothing to it. That is not a self-perpetuating system. A selfish system is a young forest.

What are your thoughts on the concept of managed old growth--that is, silvicultural management through a point in time, then the elimination of silvics and the protection of existing old growth stands?

WALLMO: By experience in Alaska, along about the turn of the century there was a reason to high-grade those lower-elevation forests for individual trees. Single trees were needed for salmon trap floats and a few other purposes. The logger was not interested in silvics, per se. He was not interested in what happened to the forest in the long run. But, as a result of this kind of logging--taking out one or two trees here and there, or sometimes a small group of trees--the ecological integrity of the stand was altered insignificantly. It seems possible to do this and capitalize on some of the merchantable volume in there. The process is rather inefficient compared to clearcutting, but it can be done in a much better fashion from a silvicultural standpoint. We would have to enter it experimentally to learn if it can be done and what the costs and benefits would be. Benefits would be in terms of economics (transportation costs, management costs, and so forth) and in terms of the environment (those ecological values that we have discussed).

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* Transcribed comments.

Does the Forest Service or anyone else have the money to do the long-term, massive research needed to find answers in old growth? If not, how serious are the budget cuts to the experiment station for this research?

THOMAS: It is a matter of public record that research there, essentially Forest Service research, was budgeted at the same level in 1982 as it was for 1981. That indicates a loss of ability equal to the rate of inflation.

In the president's budget, recently submitted to Congress, I believe the reduction for Forest Service research is 17 percent, to which we haven't added inflation costs. I believe that whatever salary adjustments are made will also be taken out of the budget. Laboratory closures in the United States have been announced during the last several days.

That doesn't mean that we can't take on old growth research. We have a new program in old growth, and there has been some money allocated to that in the last budget. That's essentially seed money. I think a research program will largely depend on contributions from management arms--the Bureau of Land Management and the Forest Service and private industry. Also, as a matter of interest in the last budget, most of the old growth wildlife research done in the Pacific Northwest has been done by Dr. Meslow's Oregon Cooperative Wildlife Research Unit, which no longer exists in the 1983 budget.

MESLOW: We also didn't exist in the 1982 budget.

How much old growth Douglas-fir currently exists in the Pacific Northwest?

MESLOW: That would seem to be a pretty straightforward question which a panel like this ought to be able to field pretty well. About ten years ago a group of people assembled to start worrying about management of the spotted owl. One of the things that immediately came up in that group was, "How much old growth do we have around?" because that appeared to put constraints on how they were going to manage for this beast.

There were representatives of the Forest Service and BLM at the meeting. They were the principal components of the team. They said, "We'll run home and in about three weeks we'll have the answers from our foresters as to how much old growth exists out there." After about four weeks the answer trickled in, "We're sorry, we don't count trees that way." It wasn't, at that time, totted up in a fashion amenable to a definition of old growth.

We do have a considerable amount of old growth still in the Pacific Northwest. I think everyone recognizes that. Probably several million acres, something on that order. Looking at it another way, how long can the current rate of old growth harvest continue? I think it's programmed to continue on most national forests on the order of 40 to 60 years at the current rate of harvest. The BLM districts are not in quite so fortunate a position. Some of them are down to 10 years. Most of them will be out in about 30 years.

The distribution of old growth in Oregon poses other problems. We already have very little in the northwest part of the Coast Range. There just isn't any there. When we look up into the state of Washington and try to develop corridors between the various pieces of old growth, we find a lot out on the Olympic Penninsula. That's isolated, however, from the old growth forest in the Cascade Range by the urban development along the Puget Sound. We have real problems maintaining a distribution of old growth if our intent is to maintain distribution of animals. There's quite a bit remaining, and it's going pretty rapidly. The answer is, "We need to act now, especially to control distribution of the remaining old growth."

Would Wallmo comment on the banking theory espoused by Bob vincent?

WALLMO: Bob's idea that old growth is a cemetery is a gross oversimplification testified by the information that Dr. Franklin summarized. Old growth forests are highly productive of many things.

We can specify some units of the things that are produced. I'll use the example of Sitka black-tail deer in Alaska. We can make some wild guesses with regard to the productivity of these animals over time during forest successions. We can give young clearcuts a value of five, let's say, for 20 years. That's a productivity of 100 for a 20-year period. Then it's all closed in after that. The productivity for a brush habitat for the next 200 years would average about, let's say, one.

Here's a question posed as to the shift of climax forests. If we do have a new forest coming in, how does this fit with comparison to the cemetery?

VINCENT: I'm not sure it really does. I'm not sure the comparison with a cemetery really fits. But it's something to think about. Anyway, it is very common, for instance, for hemlock trees to seed and grow on the downed trees that are on the forest floor. Their use of dead trees is very literal, very graphic, such as when you see a row of hemlock growing right out of a large downed tree.

If we wanted to make this comparison of a hemlock replacing a Douglas-fir forest, which the question refers to, I'm not sure that this really doesn't relate to death, because, for instance, we are talking about one species replacing another species. I think that if we were talking about the spotted owl replacing humans, we would be talking about death.

I would say that even though we have young trees coming in underneath an old growth forest, it is a change in species, just as if we were wiped out and a different species was here over time. These hemlock trees, then, depend largely on the organic debris on the forest floor for their growth.

FRANKLIN: There's no question that Bob is right that life does run on death. Any farmer who has to maintain the soil organic-matter content of his field so that he can grow another crop of corn knows that. I bow to Bob Vincent on that; life does run on death.

Frankly, it's quite true that the growth in old growth is primarily going to hemlock and cedar (one species less valuable, one species more valuable than Douglas-fir). The point is, there are shifts taking place.

To say timber volume in a stand is remaining the same is not to say that the dollar value is remaining the same, because there are differences in species value. Then there are increases in the value of particular qualities of wood as they sit on the stump.

There is a trend in national forest planning to use indicator species to represent plant communities and their wildlife. Is it reasonable in your opinion to use spotted owls and pileated woodpeckers as keys to old growth management as compared to ecosystem management?

FRANKLIN: I don't believe in using individual species as front men for larger concepts. If we want to preserve old growth, we should preserve old growth in the context of an ecosystem. The problem with an indicator species concept is that it switches the whole attention of what you're really trying to do to one particular bird or animal. It's not a good concept for that reason.

However, if you can keep in mind that all it's doing is serving as a front man, then it's OK to do it. But the danger is that we keep slipping off to the side and think we're talking about this bird or that mammal and that ecosystem.

What is the size and distribution of the old growth forest that we ought to manage for?

FRANKLIN: I think there are some general prnciples that can help answer that. Generally, the size of areas should be no less than 300 to 500 acres, simply from the standpoint of maintaining the viability and integrity of areas. Obviously, they ought to be scattered over a landscape instead of concentrated in one corner or another.

What are the minimal structural requirements of old growth, tree sizes and so forth, and can they be attained at high elevations, 4,000 feet plus, at 200 years?

FRANKLIN: It's going to be tough to attain the right kinds of structures at that elevation and those time spans. It takes longer there for the subalpine.

Have the goshawk and the pileated woodpecker declined in some other forest types?

MESLOW: We're predicting that they are sensitive and reaching their optimum in old growth. There are other parts of the country where there isn't nearly as much old growth timber. "What about populations there?" "Do we have any information that they have declined in other areas?" I think the key here is the way we are referring to this set of wildlife species. We're saying that they are reaching their optimum population levels in old growth. Perhaps the optimum population levels may be on the order of eight to ten times as high as compared to areas where suitable habitat is not present.

To specifically respond to that question: again, I think we have to beg lack of information as to what pristine species population levels, such as the goshawk or the pileated woodpecker, might have been in other parts of the country.

If 500 is magic, then how did a group of experts, in devising a management scheme for the spotted owl, end up with 400 pairs?

MESLOW: First of all, it's 500 individuals. I'm not sure that I made that clear. So we're kind of over a hump when we're looking at 400 pairs of spotted owls distributed in Oregon. I think the key here is distribution. We wanted to make a prescription that would provide an adequate number of animals from a genetic point of view. Once that is satisfied, then a second objective was to keep those animals distributed throughout their original range. They aren't just all tied up in the northwest corner or the southeast part of the state.

SOCIOLOGICAL ASPECTS

Speaker: Dr. Richard P. Gale, Associate Professor of Sociology, University of Oregon, Eugene

Response Panel:

- **Dr. Perry Brown**, Head, Resource Recreation Management, Oregon State University, Corvallis
- **Mr. Iain Robertson**, Associate, Jones & Jones Architects and Landscape Architects, Seattle, Washington
- **Dr. Carl Hosticka**, Assistant Professor, School of Community Service and Public Affairs, University of Oregon, Eugene
- **Dr. Earl Pomeroy**, Professor of History, University of California, San Diego

Moderator: **Annabel Kitzhaber**, League of Women Voters

SOCIOLOGICAL ASPECTS OF OLD GROWTH FORESTS*

Dr. Richard P. Gale

What I want to present is not a totally balanced view. I have some very strong feelings about the positive values of old growth. But because we don't usually insist on multiple use for every acre, I assume that we won't insist on a balanced view in every presentation.

There are several things regarding old growth that we might look at under a general sociological umbrella. We might examine some "people problems" associated with recreational uses of old growth. We might examine how political and social dynamics affect the ways in which old growth has become a controversial issue (and have generated this attendance today) and speculate on where these controversies might lead us in the future. Or, we might do a mini "social impact assessment" and look at impacts on society of different old growth management alternatives.

What I want to do, however, is something different. I want to look at how two central sociological topics might apply to the topic of old growth. The two concepts are human values and value dimensions, and social hierarchy. The first concept borrows a bit from anthropology, while the second is at the core of some current sociological thinking.

Before commencing with the discussion of values, I want to comment on old growth as a part of American culture. A fundamental way to begin thinking about old growth is with the concept of culture. I'm defining culture sociologically as that complex whole which includes everything that a society thinks, does and has.

Asking whether old growth is part of our culture leads us to two notions about culture. The first is that "things," the material parts of culture (what archeologists love to dig up and use to reconstruct life in those societies), become part of our culture only as they are given a symbolic meaning by society. These meanings occur either through some technological use of the "thing," such as when we discover a new use for a particular resource, or through some attachment to one of the other social institutions in society.

Those of you who have looked at American Indian culture know that very often some part of the physical, natural environment is an integral part of that culture. Political institutions pass laws on how we should think about parts of the natural environment and, for example, these laws give us a different view on the controversies over air space.

Because the meaning is arbitrary, in the sense that the culture can decide what meaning to give it, people within a culture can disagree about which meaning is most appropriate.

For something to be a part of our culture, it must have a meaning that is shared by others. You can't just dream it up on your own. The meaning has to be somewhat enduring. However, it is possible for different groups of people of different subcultures to hold different, equally legitimate (in terms of being a part of the culture of some cluster of people) meanings of the same thing. I think this is what we have with regard to old growth.

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* Transcribed speech.

We have competition for symbols and meanings of some things which several years ago were not defined in any special way. Foresters probably saw old growth in terms of the relative age of the stand, and most foresters probably didn't focus on the age of specific trees, given the assumption that the best forest management would probably occur in an even-aged stand in which the oldest tree was under 100 years.

The public, including myself, probably viewed old growth as those big trees under which it is really nice to walk or camp. "Seen one and you've seen them all" was probably an appropriate definition for both foresters and the public.

Now, however, from a sociological perspective, we have a situation where the meanings attached to this thing we call old growth are becoming more detailed, more technical, and subject to increasing disagreement on how it should fit into our culture or cultures. We thus have a conflict between subcultures over the appropriate meaning of this "thing," this special part of our culture.

I'd like to turn now to the subject of values. For each of several value dimensions, I will first outline the polar opposites for that dimension. Then, I will provide examples of these values in our society. Finally, I want to apply them to old growth.

When sociologists talk about values, they see them as perspectives which are more enduring and less situation--specific than attitudes. Values are more abstract and less tied to particular situations than are attitudes. They are on a "higher" conceptual level than attitudes. There are several basic value dimensions found in all cultures, in that cultures have to "decide" how they stand on these issues.

My general perspective is a preference for value diversity over a potentially monolithic value system or culture. Further, by focusing on challenges of values generally considered dominant, it may help us reflect on the values which have gotten us here. The key question is, "Are these same values appropriate to get us through the next two or three centuries?

I'm going to deal with four different value dimensions. At a Forest Service workshop several years ago, a person gave a comparable kind of discussion of values. It was a great after-lunch speech in that he had people get up and line themselves against the wall on each of these value dimensions--where do you stand, literally. As I go through these value dimensions, you might think where you stand, because in each case I'm going to talk about polar opposites on the value dimensions, where our society is on those dimensions, and where old growth fits in.

The first value dimension is, "How do people relate to nature?" In one corner we would find people who believe that nature should dominate us and that we should feel subjugated to nature and whatever the gods have in store for us. On the other extreme, in the other corner, there would be people who feel it is appropriate for us human beings to be in a position of dominance and control over nature. Clustered in the middle would be those people who feel it is best to live in harmony with nature.

If we were doing the line-up-against-the-wall exercise, we would acknowledge that much of western civilization, from Genesis on, has favored a people-over-nature perspective, with an emphasis on bending nature to our uses, and sometimes not worrying too much about the consequences.

We have also seen some limited expression of the opposite perspective--issues such as let-burn policies and the animal liberation movement are dramatic examples. But obviously there would be a cluster of basic environmental concerns somewhere close to the nature-as-dominant position. And, I suppose our friends from the Forest Service would line up in the middle proclaiming multiple use as the center on that continuum.

Thinking about how this perspective impacts old growth, we find ourselves confronting a paradox. The idea of preserving old growth (allowing it to further evolve) comes out of a perspective which is closer to the nature-over-people end of the continuum. But that management needed to do so reflects more of a people-over-nature view, in that nature would have removed much of the old growth for us.

On a general level, however, we can acknowledge that much of the interest in old growth preservation is a strong reaction to what many feel has been too much in the way of attempts to bend nature to our desires. I see, therefore, a strong questioning of our people-over-nature perspective as leading many people to wish for additional symbols such as old growth, which reflect a hands-off, natural-evolution approach, even though the reality may require some intensive natural resource management, as Dr. Franklin mentioned.

The second dimension concerns time and asks, "How do we relate to the concept of time?" Again, there are three fairly distinct positions. Past, present and future is a simple summary.

At times, our society, or at least the middle class, has been one in which the future dominated the present (deferred gratification, work for tomorrow, plan ahead, etc.). Currently, some would argue that the narcissistic "me" generation seems to be living almost exclusively in the present. Ours is also a society that generally has not looked very far into the past. Where we did give it a look, we were often quick to get rid of the old and incorporate the newest of the new into our lives.

Concern for old growth is a direct response to what some perceive as an overemphasis on the future and focusing present management almost exclusively on some future state. Old growth forces us to look backward and acknowledge the past and our need to have some physical, tangible link with that past. I think we can all recall in our childhood looking at an exhibit which placed several centuries of human events on the rings of a large tree stump. Old growth, then, jars us out of a lifetime-limited timespan. Old growth management moves us to thinking of perhaps a 300- to 400-year rotation. Typically, we have a hard time thinking of time much beyond half of a lifetime, 35 years or so. It is hard for us to conceptualize much beyond the time in which we can do something and perhaps see the consequences of it. Even thinking in 65- to 100-year rotations is the equivalent to the upper edge and beyond the lifetimes of most of us.

In other ways, old growth moves us into the future, encouraging us to take a longer look into that future and what life might be like under some post-industrial and limited-growth kind of society. A problem, of course, is that we really don't know what post-industrial society is going to be like. Old growth may help us with this time frame, and to think how life might be in that longer time frame. No society would want to foreclose the options it might have for the things that it might need or that some future generation might need.

The third dimension is, "How will people relate to each other?" This dimension explores how people view and interact with each other and who they feel are important "others" in their lives.

Again, there are three basic positions on the dimension. The positions are lineal, egocentric and collateral. An emphasis on lineality focuses on an intergenerational line--the family, the clan, the village--and includes a preference for interaction with persons who share some common heritage, but who differ in characteristics such as age and sex.

An emphasis on collateral relations cuts it the other way and focuses on a preference for people who share the present and have similar characteristics. The peer group or professional colleague relationship are good examples.

The third and perhaps middle position de-emphasizes both collateral and lineal relationships and views the individual as going it alone through a series of relatively transitory relationships. The focus is on meeting the needs of the individual. We see this reflected in popular self-help psychology books, such as First Person Singular and How to Be Your Own Best Friend. This position de-emphasizes any long-term personal attachments. In general, the United States has been characterized by a shift from lineal to collateral and possibly even to egocentric value preferences. We have tended to de-emphasize lineal relationships, although, again, there may be some change in perspective.

In part, some of the requirements of a rapidly changing, high-mobility society have moved us to a more egocentric model, since it is not easy to transport an extended family with you as you go seeking those promotions. Because those in your peer group may be competing for the same promotion, you may not want to share yourself too closely with them. Our general lack of commitment to lineal relationships is, of course, also tied to our time orientation.

To the extent that either collateral or egocentric preferences dominate, old growth takes it on the chin (or on the stump). Old growth, and an appreciation of human nature generally, are not consistent with an egocentric perspective. I am my own best friend, some tree isn't! People have talked about our commitment to the "human exceptionalism paradigm"--essentially, where we see ourselves as different from other parts of the ecosystem and believing that the laws of nature really don't apply to us. This paradigm or framework is most consistent with an egocentric value position.

Our emphasis on collateral relationships suggests that, just like foresters, we too prefer even-aged stands. Our preference is for associating with people who share our age, occupation, and social status. Further, we don't treat our human old growth well at all, except to accord them a temporary historic or endangered species status on special occasions.

Where lineal relationships lead us to look toward younger people, our human role models seem to be the healthy young stands of the youth culture. A focus on old growth then, shifts us toward a more lineal orientation, toward thinking in terms of multiple generations and toward an appreciation of older components of our culture.

A second aspect of the relational value also concerns our view of old growth. A part of our value preferences for relationships deals with the degree of narrowness, or conversely, the breadth of contacts with other people. Ours has been characterized as a highly specialized society in which we each do one thing and we do it (hopefully) very well. That is, we tend to interact with other people primarily in terms of fairly narrow slices of our lives. We don't know very much about our co-workers or our neighbors. This specialized division of labor is fairly consistent with an egocentric perspective and least consistent with a lineal view.

One might argue, then, that an appreciation of old growth contrasts sharply with a narrower view which focuses primarily on the merchantability of forests for lumber or wood fiber. Thus, thinking about old growth may move us to reflect on how we relate to others and facilitate a more encompassing getting-to-know-you.

The last value dimension is a sense of place. The basic issue is the extent to which people give some importance to a place and how society views varying rates of geographic and social mobility. On one extreme, we would give maximum value to the notion of place and to the permanence associated with it. The other extreme would define geography and the sense of place as fairly irrelevant, as something that is easily molded, re-created, or transferred within a society. Place, in this latter extreme, might be seen as something outside of our society or as a very minor element of it.

The sense of place in American society has undergone several important changes over the past two centuries. During early settlement, we gave very little importance to place because the focus was always on other places, on new places, places to go and carve something out of the wilderness.

With the closing of the frontier, development of farms and the establishment of towns reflected much more importance on the notion of place, and place was seen as evidence of progress and stability--the town square, having my own land, my own farm, my own place, etc.

Since World War II the prevailing perspective of American society has been to minimize the sense of place and to value a high rate of geographical mobility, especially when accompanied by occupational advancement. We have also placed a positive value on the development of standardized places. "There are no surprises at Holiday Inns." And other types of special places in our society have become marketable commodities, in a sense that a re-created village may be a nice place to visit, but we really wouldn't want to live there.

The most recent emergent view in American society does provide, I think, a reemphasis on the sense of place and a decline in the desire to move frequently. Large corporations are finding that the old mobility patterns for individuals no longer apply, particularly when a dual career problem encourages people to put down roots in a large metropolitan area. And, an emphasis on the development of community distinctiveness and the uniqueness of individual communities reflects some change in our sense of place.

Old growth, then, contributes several things to this sense of place. It is a symbol of stability and, from an ecological point of view, a symbol of natural lack of place change. It provides us with a sense of how it was or at least how we like to think it was.

Old growth also provides a somewhat different way of linking time frames and places in that it slows the general pace of time change and stretches time/place change beyond a single generational lifetime. The change in an old growth forest over a 200-year period is certainly less significant, and less rapid, than a comparable change in the six or seven generations or two-plus lifetimes that would occur in that same period.

Old growth also symbolizes something that is distinctively not portable and not relocatable. It's the opposite of the totally self-contained carnival midway which, with its diesel generators, can be located anywhere. Old growth can't be transported; it is uniquely place-specific. Old growth also provides a vehicle for emphasizing the distinctiveness of a place, a region or an ecosystem, in contrast to the "no surprises" emphasis of conversion to even-aged, Douglas-fir, managed forests. (However, from a different perspective, one can also argue that old growth does not provide several key features that we expect in a place--notably diversity within a place and a sense of progressive change.)

On balance, my own perspective is that old growth does respond to our increasing need of a greater sense of place and stability within a rapidly changing society.

I have reviewed several major value dimensions. In each case, we can talk about the dominant values, and we can sense in our own perspectives some challenge of those dominant values. What I've tried to do is to help you imagine how old growth relates to these values and perspectives.

The second concept that I want to deal with has to do with social hierarchy. Hierarchy is a major variable for sociologists. It calls forth a number of potential keywords, some of which may have little to do with old growth: dominance, stratification, progression, conflict, inequality, distribution effects, hierarchy of needs, "whose ox is gored?" These are all variables which really get into a sense of hierarchy.

There are two ways in which the concept of hierarchy might apply to old growth forests. The first is a stratification analogy between people and trees. Sociologists use the notion of a class system to refer to societies which are made up of different social classes. These classes are usually defined in terms of certain factors (occupation and education in our society) which are differentially valued by society. Although foresters use the term "age class," I am not aware of a more general silvicultural stratification system which might be comparable to it. However, pushing this analogy a bit, one might pose such a system within which old growth would stand as a symbol of a traditional upper class: a traditional matriarchy or patriarchy within the forest.

Similarly, alder and hardwoods are sometimes seen as an undesirable lower class. A few of them can really ruin a neighborhood. This lower class contrasts with the productive working or middle class composed of youthful and active adult Douglas-firs. Although sociologists are usually anti-hierarchical, we also recognize the importance of diversity in society. In this case, at least, I would vote in favor of the continuation of a stratified forest hierarchy, rather than for a "forest socialism" composed almost exclusively of relatively similar working-class Douglas-firs.

The other way we can use the stratification process has to do with a link to the political process. One of the basic links between stratification and the political process occurs when one thinks about "distributional" or "equity" effects, concepts that were previously the province of economists.

Increasingly, however, forest policy issues have focused public attention on differential, hierarchical impacts. Consider some current forest policy issues: log exports, and timber holding companies versus those dependent on Forest Service timber; sustained yield versus accelerated conversion of old growth and response to market conditions; changes in the cash requirements for Forest Service timber sales. In all of these issues, a major component is the potential for hierarchical impacts on companies of different sizes.

Old growth is not in itself an issue which relates directly to distributional effects, unless one examines impacts on timber-generated employment. However, old growth does feed back into some of these other issues in terms of policy priorities. Specifically, some observers see a new emphasis (or reemphasis) on economic factors. As a sociologist, I am not convinced that one can easily defend old growth preservation primarily in terms of economics. (Similar kinds of challenges which were faced by the wilderness arguments usually weren't won in terms of economic values.) What I am concerned about is that I see an increasing shift toward the dominance of economic analysis. The issue of old growth should serve to remind us of the importance of noneconomic, amenity values as an integral part of the resolution of forest policy issues.

A different sociologist might have given you a different talk. Indeed, I might have given you a different talk several years ago. As I indicated when I began, it is also the case that I have some strong feelings about old growth, even though the Douglas-firs that I see from my office are in need of more intensive management. (The crowns are broken off and they look terrible.)

What I've tried to do in this short talk is to give you some basic sociological glasses through which to view the old growth issue. The glasses by themselves don't define a right and wrong way, and a different set of social science glasses might give you a different view. However, the substantive illustrations of how these glasses might be used do reflect my personal hope that they will help us see the light as it filters through an old growth canopy and onto a cool, mossy forest floor.

SOCIOLOGICAL ASPECTS: Response by Dr. Perry Brown*

Much of what concerns us about old growth centers around different groups of people. There are several different questions one needs to ask: "What is old growth from the point of view of different groups of people, and how would they define it?" "What do people see when they look at old growth?" "What are its relative attributes to different groups of people?" "What does old growth do for people or what functions does it serve for us?" "Why is old growth important for different people?"

We need to know what precepts and motives are being served by old growth for individuals and for groups. And then, if one concludes that old growth is important and needs to be maintained or produced, can we maintain and produce it given our knowledge, technology and competing desires? At this point, when I talk about producing "it," I mean those attributes of old growth that are relevant to different groups of people who say it is important to produce it.

Most of my questions can be cast in the framework of what some might call environment perception. What is it out there that we are interested in? How do we view it? How do we process that view of it? What does it mean to us? Or, what is the meaning of old growth?

Much of what Dr. Gale has described allows us to look at these questions from different angles, through different glasses, as he mentioned, given the many different perceptions and frameworks that people have. I think this is particularly valuable given all the dimensions necessary to answer the questions that have been posed.

We still need to answer those questions. We need to know the value of old growth, what it means to different people--to the mill operator, to the recreationist, to the ecologist, to the driver who passes through the old growth, to school children on an outing, to the businessman of the community that serves the logger, the mill hand, the scientist. We need to find out what those people see as old growth and what it means to them.

In his discussion, Dr. Gale led us through several ways to see how others might see old growth. He discussed many value dimensions and social hierarchy. And he discussed such things as different perspectives on time, hierarcy, relationships to our normal lives, and relationships to other people. If we look at what we know about recreation which might occur in backcountry, often roadless areas, we can see some possibilities using the different perspectives Dr. Gale has brought to us and find answers to some of our questions.

Let's look at how some of our recreationists are dealing with old growth. Whether one looks at recreationists in the east or the west, our findings would suggest that the backcountry, somewhat untouched environments provide different kinds of experiences which are common throughout the country.

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* Transcribed comments.

Old growth provides some opportunities to have some relationship with the natural environment. It provides some escape from the physical pressures--the sights and sounds, those physical things that impinge upon us. It provides escape from social pressures and other people with whom we deal. Exercise and physical fitness have been associated with those kinds of environments. Group-oriented experiences are very often important in those. Experiences centered on learning about one's self and about environments are important too. All those things are woven somehow into the things Dr. Gale just led us through.

To say that obtaining each of these experiences is solely dependent on backcountry or wilderness or old growth is wrong. But to say that people do value these experiences in these environments is right. To say that these environments provide opportunities for these experiences is also right. Old growth is not the only place where we can obtain these things, but old growth is a place where we have learned to obtain these things. Also, many of the experiences relate to many of the other things that Dr. Gale has suggested to us in his paper. We can set about hypothesizing how people view old growth and what it means to them. To pick up on a few things that Dr. Thomas mentioned in the last panel, we need to find out what it means to people and what its dimensions are.

SOCIOLOGICAL ASPECTS: Response by Mr. Iain Robertson*

I'd like to start by commenting on Dr. Gale's analogy of the sociological glasses. It's interesting to me that he used the term sociological glasses rather than the term sociological hearing aid. Basically, the sense of sight is the predominant sense. That is the one that is most important to us all. That's the one we get the most information through. We rely more on that one sense than all the others.

Hence, the importance of the visual environment. There is an analogy here to what the speakers on this morning's panel said with regard to research on old growth being a relatively new thing. Similarly, research on the visual environment and defining the visual environment is also a new thing.

Legislation at the federal level, the National Environmental Policy Act of 1969, required that this be done. The Federal Land Management and Policy Act of 1976 also required that federal agencies consider the visual environment in their management of public lands. Since that legislation, the land managing agencies of the federal government have all begun to develop visual resource assessment systems. The Forest Service has its visual management system, the BLM has visual resource management sytems, and the Soil Conservation Service has a landscape resource management system. Similar research has been going on in the private companies in the design profession and in research at universities and other places.

Basically, we've only recently begun to look at visual resources as something alongside the other factors that we consider in preparing a forest plan, for example. The relative newness is something we might return to later in some of the comments people make.

Let me briefly characterize what the visual resource management systems contain. Visual resources are defined in a whole series of different terms: form, line, color, texture, the patterns that these make, dominance, scale, diversity, and continuity. These are all terms that are loaded with meaning, sometimes, unfortunately, with different meanings to different people. Visual quality can be defined in terms of vividness, intactness and unity. If we use these terms to analyze old growth, we generally come up with the conclusion that it is a high-quality, visual environment.

We also look at viewers in our analysis of the visual environment. We talk about viewer exposure or how long one is exposed to this type of view, how far distant is the thing we are looking at, and how sensitive is one to that view. Sensitivity is something that varies depending on what we're doing. Sensitivity is also related to the context one sees the view in, the uniqueness and the rarity of the view, the cultural and historic significance which Dr. Gale mentioned, and whether one has an appreciation of the naturalness. There's a sense in which naturalness can be equated with a religious feeling in a large number of people. Using all of these measures, I think we're finding that old growth is something people are becoming more visually sensitive to. We're giving it greater value.

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* Transcribed comments.

I'd like to leave you with the thought that not only do our systems define old growth as a high-quality environment, but we are also seeing more and more people becoming more and more concerned for and sensitive to that environment.

SOCIOLOGICAL ASPECTS: Response by Dr. Carl Hosticka*

I think it's important to note that as we discuss old growth as a subject, we also have to realize that we are really discussing ourselves, because if it wasn't for us there really would be no issue at all. It's worthwhile reflecting for a while on ourselves and how we individually relate to old growth. I think Dr. Gale did a very good job of bringing that to our attention and indicating some dimensions of the issues.

What I want to do briefly is to take off on his theme of values and subcultures and look at the relation of values and subcultures, subcultures being defined by the values they hold. We were at a conference last week where we identified the subcultures as timber beasts, eco-freaks, and feds. If any of you don't fall into one of those, then please let us know what your subculture is.

I think it is important for us to look at that and look at the sociological-ecological diversity among ourselves and to see how we relate to each other. A couple of comments that I would add beyond Dr. Gale's are the importance of language when we start to look at ourselves and how we relate to the world. Dr. Brown was talking about what we see, and Mr. Robertson defined some terms for us.

The language we use not only communicates what we see, but also, to a certain extent, shapes the perceptions of what we see. It provides a mechanism for us to interpret what's out there. I think when we pay attention to old growth and pay attention to ourselves, we need to look at our language, because at times it can be a barrier to communication as well as a facilitator.

I thought I would indicate what struck me a few years ago when I first started becoming interested in forest policy and started hanging around with people who made their living in the forest, either as timber beasts or feds. Some of the words they used struck me as being very peculiar.

Now I know I'm talking about one group from my perspective, and this could just as well apply to other groups. But it was interesting to me to hear the words they used to describe what was out there. I heard discussions of "tracts of timber," "patches of timber." I was looking at trees, I wasn't necessarily looking at timber. A term that has always interested me and intrigues me still is the term "inventory on the stump," or "wood on the stump." Again, I thought a stump was something that was left over after you cut down a tree. It's not necessarily a thing that has wood sitting on it. When they would describe old growth, and we've already heard some of these terms today, they'd say that it's "decadent, stagnant, or overripe." Again, it conveys an image of what they're seeing.

Then we look at what we do to old growth, and again these terms become intriguing. We don't cut trees, we make "management entries." We don't clear-cut, we do "regeneration harvesting." And, finally, the term that started out the day and is perhaps the most startling, we're talking about "liquidating" the old growth. The term liquidate is one that sometimes has a negative meaning to some groups in society.

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* Transcribed comments.

I don't want to disparage these views. All I'm trying to do is make us conscious as we proceed through today and future discussions of how we use the language and what meanings we are conveying through the use of language. The goal is to make us more sensitive of how others use it.

SOCIOLOGICAL ASPECTS: Response by Dr. Earl Pomeroy*

The social values that Dr. Gale outlined have long figured in public policy in Oregon and in the United States. Surely old growth forests ought to be safe. The values that the old growth forests represent ought to be respected in a state where we show our respect for the past by keeping the oldest constitution of all 50 states; respect for place in nature by being the first to tax gasoline and use revenues from automobiles for state parks; respect for the environment by being the first to stop the use of nonreturnable bottles; respect for the future by forbidding government to go into debt; and respect for age by devising alternative home-care options in place of hospitalization for recipients of Medicaid. But nationally, as well, there's been a persistent, recurrent emphasis on social values, not only in general but on social values relative to the disposition of forest lands and use of forest resources.

Well over a century ago, naturalists such as George Perkins Marsh and John Muir, and later, Gifford Pinchot, were talking about the social as well as the physical returns of forests, including old growth forests. Marsh talked as early as 1849 about the uses of primitive, virgin forest lands in preventing erosion and maintaining water supplies by holding rainwater and snow. Also, they provided breeding places for birds and other useful animals.

At the same time, while Americans have talked about social values attendant on preservation, Americans invoked other social values to destroy their forests on an enormous scale--sometimes speaking of forests as areas of stagnation and noxious vapors that should be destroyed for the sake of public health or, more often, simply emphasizing the social returns of converting forested land into family farms.

This process of destruction (so efficiently produced that the forests covering the eastern third of the United States disappeared almost as rapidly as the passenger pigeon and the buffalo in the last century) led to a new rethinking of social values in the early 20th century. For example, in the midst of timber shortages, this rethinking led Californians to speculate in plantations of Australian gum trees which they thought would be useful for both fuel and sawn lumber. The Weyerhaeusers and other timber interests developed a new kind of timber industry on the Pacific Coast in the Pacific Northwest. They were so highly capitalized that economic and social losses resulted in complete depletion and in much greater losses than had followed previous policies.

So policy makers talked increasingly in this century of the social returns that would follow from preservation as well as exploitation.

Now we're in another area. In the 1970s and 1980s ecologists have been documenting the arguments of the pioneer ecologists as never before. The Sierra Club has been gaining members as never before; with every speech of Secretary Watt the new membership cards come in. The government is proposing to meet the economic problems of this depression (or recession, if it is that), not as it proposed to meet the economic problems of the '20s and '30s by restricting production, but by increasing allowable cut. What historians can suggest about this and its social implications are at least beyond this historian, because there is no record in history of prosperity for the construction and timber industries in times of high interest rates and unemployment, regardless of access.

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* Transcribed comments.

SOCIOLOGICAL ASPECTS:
Responses to Questions from the Audience*

Given inflation, the higher cost of gas, and the trend to a smaller scale of living, should there be lower-elevation old growth set aside for easy access to recreation, for aesthetic purposes? Why or Why Not?

GALE: This is my favorite issue. It is important to think about transit-dependent people. Most of us are not transit-dependent, but my mother is. My mother lives on the eastside of Portland and does not drive, but likes to go out and engage in a little forest recreation once in a while.

Her view of the world is a very interesting one. How do you get to Mt. Hood National Forest by bus? Well, what you do is take Tri-Met downtown; you find out what the Trailways schedule is; you take Trailways up there--you have your backpack, your lunch, maybe a tiny little shot of something with which to sit along a stream, and maybe even your flute. You get off the bus right above Zigzag and walk down the road and sit by the stream for a while. You know what time the bus comes back from Bend--hopefully it's the same driver. Then you take the bus back to downtown Portland. That's a day for her.

One of her favorite places is a BLM campground. Unfortunately, they apparently wanted to get cars and trailers from the highway to the stream as fast as possible, so they "turnpiked" the road. It was a very narrow road with no shoulders. When that happened, she couldn't use the campground anymore because she couldn't walk on that road with the campers and motorhomes whizzing by.

I am obviously appreciative of my mother's efforts. In a sense, I suppose you could argue that many of us will be in that situation in another 20 or 30 years. To think about the forest in terms of those of us who will be transit-dependent, immediately gets you into issues of lower elevation and this kind of access.

If I had a lot of money, what I would do on an experimental basis would be to run three buses every Saturday and Sunday from Eugene up the McKenzie River to beyond Blue River, across the Willamette National Forest to Westfir and Oakridge, and then back to Eugene. There's a tremendous variety of forest experiences available along that route. So, the answer is absolutely, we should have more lower-elevation old growth sites.

Is it not more important sociologically to maintain many small pockets of old growth near the population centers than to have vast, removed areas?

BROWN: Of course, in the particular description Dr. Gale just gave, the answer would be yes. Absolutely, yes. You need to have those areas because you have the ability to serve more people in that sense. On another line though, the answer is no, because one of the values that people are interested in might be associated with some tracts of old growth. That value is vastness of scale, which is the concept of place Dr. Gale talked about in his paper.

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* Transcribed comments.

If the vastness of scale is important, in some instances it might have to be removed from the population centers. If we value diversity in forests and forests for recreation, then we need some of both. What we have to decide is whether having some of both is more valuable than some other things that we might want in society.

For a vast majority of people, a forest recreational experience involves camping, picnicking, boating, etc., at some sort of developed facility. The settings for these facilities could be in either old growth or second growth timber stands. Do you think the experiences of these people are significantly different if the setting is in second growth as opposed to old growth? How and why is it different?

BROWN: My simple answer to that is it is no different in second growth because second growth is old growth. One of the things discussed in the last panel was the theoretical possibility of producing some old growth. It's just a matter of letting second growth stand for a long time until it becomes old growth. We have witnessed that in the eastern United States. The forests that were cut-over have come back. The forests in the northwest are not the first forests that were ever here.

It's no different if we let second growth become old growth. But there may be some differences in a short time period if we see this forest has been manipulated. Then some of the things that we experience in recreation may not be the same. They may be different kinds of things.

ROBERTSON: I think, from the point of view of visual management, it is possible to re-create something that looks to an average observer like old growth. I don't think a designer could ever create something that could satisfy an ecologist who is familiar with old growth stands. But I think for the average observer it would be quite possible to create something that looks sufficiently like old growth to convince him that it is. It may, as Dr. Brown said, take 100 years or so.

Is there a quantitative difference between one's personal sense of insignificance and an old growth stand compared with one's sense of proportion of being in a stand of young second growth?

ROBERTSON: I feel inclined to ask the person who asked the question to stand up to see how tall he is. I would say that obviously when one enters a stand of old growth, it's definitely the bigness of it all that impresses one. One doesn't have to be from Texas to appreciate bigness in that respect. But that's also true of young second growth. Once it reaches something like 100 years it's totally out of proportion to ourselves. Comparing one's self with a 250-foot tall tree versus a 70- or 100-foot tree, I would still say that they are both perceived as extremely large things in comparison with ourselves.

Do you feel that old growth is important as part of nature with which modern, egocentric people can identify?

ROBERTSON: Definitely yes. I think that the best way that could be answered is by quoting Thoreau when he said, "In wildness is the preservation of the world." I think the same thing can be said for old growth.

What recommendations would you have for the federal land managers to plug-in the public to future decisions on the disposition regarding old growth timber?

HOSTICKA: Although I don't know the exact meaning of "plug-in," I think today is a very good start. In fact, today is a very good continuation of the process that Bob Chadwick and Mike Kerrick have shown; that is, a great openness to the public and a willingness to accept public views in their planning.

There are a few things that I would suggest personally, as a member of the public, which would help this process. First of all, I would like some indication of what issues the Forest Service is grappling with and how they define the problem, so we can relate to them. I would also like land managers to share issues with the public when they have uncertainty and doubt. I'm sure those of you who have done any planning have considerable doubt about some part of your planning process and have to make assumptions and decisions. I think it would be a lot better if you shared those with the public while you were in a condition of doubt.

I dabble in politics a little bit, and I find that it is much easier for me to defend an issue when I'm 90 percent sure than if I am only 60 percent sure and people are coming down on me. It's that 40 percent of doubt that continues nagging at the back of my head and causes me problems. I think that if land managers were open to the public in those conditions and would share their doubts, we could all work more productively together.

Can you give us a picture of how the Willamette Valley and the western Cascades looked physically a hundred years ago? How far down the slopes could one find old growth timber a hundred years ago?

POMEROY: A partial answer to that is that in this immediate area, say Lane County, things looked barer then than they do now. What some people think are old trees in Hendricks Park in Eugene are 20th century newcomers. Photographs of the Willamette Valley show things are bare. Our pioneer ancestors were quite efficient in cleaning things out and burning things up by the time photographers first appeared in the Valley around 1850. All those so-called big trees on the University of Oregon campus were planted around the turn of the century.

> **Is our culture having an extremely difficult time with intangible values when we place so much emphasis on stratifying, classifying, prioritizing, and so forth?**

GALE: The answer is yes, we are having a hard time. I'd like to make three brief comments. One is, in some of the cases where we think that classification is easy or effective, I feel that we are actually involved in some mystification. I think of the joke about the economists, lost in the wilderness and trying to survive by "assuming" a flashlight and a compass. I think we tend to overemphasize the concreteness of the economic analyses which, in contrast to some of the more intangible analyses, seeks to be more hardheaded. However, as we begin to probe behind the economists assumptions, it becomes clear that there is some uncertainty behind many of them.

The second point is that categorizing something as "technically feasible" is really a highly political decision which also reflects economic conditions. The things that technology seem to be out to reach, might be within reach as conditions change. Several years ago when I was working with the Forest Service, there were a couple of weeks there when timber prices were so high that I think you could have personally taken a helicopter into the French Pete area (Willamette Valley National Forest) and gently logged the trees one by one. This unusual timber harvest practice became technologically feasible at that point--technologically in terms of defining the whole market system and the response to it. Thus, some values appear to be only economic considerations, but they really are, in fact, political values.

The third comment I'll make is that, as Dr. Hosticka explained, language has a major impact on the way we think about old growth. The Forest Service is part of the Department of Agriculture. Theirs is a "trees are a crop" orientation. The whole lexicon reflects the way we think about that --the thrifty, the thriving, the vigorous natural resource. We really don't have the lexicon or a language framework to deal with old growth, unless we think in terms of the cemetery--the dead, the dying, etc. We really need to work on developing an acceptable alternative framework.

> **Is the Forest Service really in the middle of that "wall," reflecting the "live in harmony with nature" value perspective?**

GALE: My sense is that if we asked the feds to go over and stand against the wall according to their value dimensions, they would probably be spread out a bit, and there would be some pretty nervous people at both ends of the continuum. We need to acknowledge the diversity and complexity within those agencies. To preserve the diversity within those agencies will help us think through some of the issues on old growth.

The backpacker, the hunter, and others who use backcountry wilderness have definite views on the values of old growth forests. What about the motorized recreationist, particularly the camper-campground type? What impact will current and recent programs to cut old growth in campgrounds have on that segment of the population?

BROWN: There's the displacement of the campground and displacement of the long-time user, and even the short-time user. If we decide to harvest in an area where we have an established campground, then we'll have to move those people to some other location. In the short run that's going to cause some problems. People aren't going to like it. "I came here ten years ago and I want to come here again, and I don't like this. So, I'm going to complain to the Forest Service or the BLM or whoever is managing the timber." That's the type of thing that will happen.

But, in the long run, unless we are lineal, as defined by Dr. Gale, it's probably not going to make a whole lot of difference. The people who come to the new campground that we built to replace the old one are going to learn to use it. That new campground will probably last for thirty years, and the people will learn to like it; then in five or ten years it will be moved to another location and we'll get a change in people.

In the short run we'll have some big problems, some people will be displaced. In the long run it may not make a whole lot of difference unless we return to a different kind of lifestyle and, in fact, do pass on all of our customs and heritage over time in one way or another.

Do you feel that man as a social whole can develop the social institutions to protect the world and ourselves from our technological developments?

GALE: I hope so. We really are beginning to question the technological fix. Every time the technological fix appears to work, it comes back and gets us. For example, although we recognize the need for household weatherization, there apparently are some little-understood radiation impacts which occur when you "seal" a house through insulation. Repeatedly, the quick technological fix only later reveals hidden impacts.

Is there a way of providing an ecosystem like old growth with a voice of its own in decision making? Can we introduce this formally into the social system?

GALE: There was a book called Do Trees Have Standing? I don't know how we can give old growth a voice of its own. People do, though, listen to those trees.

As a final remark, it is extremely important that we learn to think about the future. An excellent series in the New Yorker magazine (February 1, 8 and 15, 1982) by Jonathan Schell points out that one of the most serious problems surrounding the possibility of a nuclear holocaust is that we don't even know how to effectively think about the future consequences of such an occurence. In part, what we have been talking about today is how we can learn to think about the future and how we can approach a more lineal, intergenerational value perspective. The old growth forest issue may help us do just that.

MANAGING OLD GROWTH FORESTS

Speaker: **Mr. Jeff Sirmon**, Regional Forester for the Pacific Northwest (Region VI), U.S. Forest Service, Portland, Oregon

MANAGING OLD GROWTH FORESTS*

Mr. Jeff Sirmon

This country has been dealing with this issue since before the National Forests were created--in fact, the concerns about liquidation of forests were a major factor in establishing the National Forests.

So we find ourselves with an issue as old or older than the National Forests--an issue that shaped early policy and over the years was restated in various forms. Retention of some old growth is implied by the Multiple Use-Sustained Yield Act. The National Forest Management Act and its implementing regulations call for the issues surrounding old growth to be addressed (36 CFR 219): included are 219:1(b)(5), "Preserve historic cultural, and natural aspects of our heritage"; 219:13(b)(5) and 219:13(g), "Provide and maintain diversity in plant and animal communities"; 219:13-(b)(8), "Ensure that fish and wildlife habitats are managed to maintain viable population of animals."

On the other hand, timber management policies and concepts tend to encourage conversion of old growth to managed forests: 2403 Policy: Promote programs that meet the Nation's need for timber products; 2503.2(1) Authority: . . . cut timber when it is "mature," which is indicated by (1) growth slowing, (2) decay increasing, (3) trees are damaged, (4) removal will help development of understory, and (5) the tree has reached its highest value (such as a power pole); and 2410.3 Policy: Produce crops of sawtimber size and quality unless exceptions are approved.

Law, policy and direction are interpreted various ways to say "cut some" and "leave some." We have been doing that for over 75 years. The situation we have now is that there are those who are saying, "Where is the line over which we must not cross?" When I'm asked, "How much old growth is enough," how do I answer? When I'm asked, "How fast do we move toward this figure," how do I answer? When asked, "What decision-making process will we use to answer these questions," what do I say?

I have a general management model I use whether addressing a resource problem or a human activity. It consists of four basic modules: inventory, what is going on; analysis, what could go on; program, what will go on; administration, resources and processes to carry out the program. At the outset, inventory stage, one must define the resource (activity) in order to know its length, breadth, depth, etc. In this case we must define old growth, and this would sound simple enough, but I have found this not to be the case.

Each group with interest in old growth defines it according to the values they see in it. Those most sentitive to its beauty have a definition dependent on visual qualities. Ecologists have a definition based on the physiological characteristics of the trees and on environmental conditions.

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* Prepared paper.

From a standpoint of wildlife habitat, old growth is that which provides the unique habitat for wildlife that are adapted to old growth. Therefore, the definition will vary by wildlife species. For timber management, trees over rotation age, that is trees whose growth has culminated, are considered old growth. This array of definitions and expectations is one of the dilemmas in reaching a decision on the issue.

A definition for old growth has been established for National Forests of Washington and Oregon. A definition of old growth becomes imperative in order to narrow our perspective to a particular set of criteria and to view the issue through the same window. We cannot discuss old growth among ourselves and with others if old growth is not defined.

National Forests of the Pacific Northwest will use the following standard definition for old growth:

> An old growth stand is defined as any stand of trees 10 acres or greater, generally containing the following characteristics:
>
> --Stands contain mature and overmature trees in the overstory that are well into the mature growth stage.
>
> --Stands will usually contain a multilayered canopy and trees of several age classes.
>
> --Standing dead trees and down material are present.
>
> --Evidence of man's activities may be present, but does not significantly alter the other characteristics and would be a subordinate factor in a description of such a stand.

This broad definition of old growth is refined by identifying the minimum acceptable stand characteristics associated with six timber types found in the Pacific Northwest region. For Douglas-fir types it is:

> At least 60 percent of overstory canopy is dominated by Douglas-fir or some combination of intolerant species. The stand will contain some trees with stem diameters 32 inches or greater, an average of two snags per acre, and 30 tons of down logs per acre. Trees will have mature bark characteristics; for example, Douglas-fir will have deeply furrowed bark. Crown height growth will have slowed, giving the tops a more rounded shape; tops may be broken. Limbs will usually be heavy and gnarled with mosses and lichens often present. Stands in these forest types will be considered old growth until there are fewer than five overmature trees per acre.

We also have old growth definitions for ponderosa, logdepole and other coniferous species. Basic to the inventory module in my model, we must determine how much there is of this subject we are examining. In the case of old growth, we have some estimates based on several definitions.

The northern spotted owl has become an indicator wildlife species for old growth. On the National Forests of Washington and Oregon, old growth covers enough land to provide habitat for 1,365 pairs of owls.

On those National Forests west of the Cascade summit, characterized by Douglas-fir forests, there are 2.4 million acres of forest which are over 250 years old and have had less than 10 percent of the timber removed. This is 25 percent of the area of those National Forests. Using the timber management definition, the same west side National Forests contain 4.5 million acres of stands over rotation age on commercial forest land. This is 64 percent of all the CFL of these forests. Additional old growth exists in National Parks and on Bureau of Land Management and private land.

Another part of my inventory module is the need to know how much is living or dying, being added to or subtracted from my stockpile. In other words, how long will my inventory last?

(a) Under the present situation some old growth will last indefinitely because of the stands protected in National Forest wilderness, National Parks, research natural areas, wild and scenic rivers, etc. However, some plant communities are not represented in theses special areas. The contribution of these special areas is significant, since they contain over 6 million acres of land.

(b) The National Forest old growth on commercial forest land being managed for multiple use with emphasis on timber production will last about 50 years under present harvest schedules. On other lands where nontimber resources are given emphasis over wood production, the old growth will last 70 or more years. This is the area where we must decide.

After we have a "fix" on the inventory, we move on to the analysis phase--that is, What could go on! What do we want to go on? How much wildlife, beauty, diversity, fiber production, and how many jobs do we want? Some of these outputs are mutually exclusive on the same acres, so how do we arrive at an equitable decision? Each National Forest will inventory old growth. Alternatives presented in forest plans will identify levels of old growth for:

--Wildlife habitat

--Ecosystem diversity

--Old growth preservation (diversity)

--We also hear concerns about spiritual values, these concerns must be addressed too.

Each plan alternative will display the effects of implementing the alternative with consideration of old growth that serves more than one need.

It is possible to plan realistically only for 10 to 20 years in the future. We must keep options open for future planners and managers. In addition, an old growth research program is being undertaken with Pacific Northwest Forest and Range Experiment Stations. It involves west side forests from Canada to northern California. The program aims to:

(a) Identify plants and animals dependent upon or finding optimum habitat in old growth.

(b) Describe, classify, and inventory old growth ecosystems.

(c) Determine biological requirements of pertinent species.

(d) Evaluate old growth management alternatives and economic aspects.

The research program will last five years. Participants will include the Forest Service; Bureau of Land Management; Fish and Wildlife Service; and Washington, Oregon and California forestry and fish and game agencies and universities. Private conservation and forestry organizations are also expected to participate. Folks of Jerry Franklin's calibre will be used. The results of their research efforts will be used for updating our plans.

The third module in my management model decides what will happen in the future. The manager will need to know what the old growth needs are for wildlife, aesthetics, etc., and then decide how much is needed, where to find it, and how to maintain an adequate distribution. Inherent in this thinking is the notion that we can manage a stand for typical old growth. The manager must decide how to provide the other goods and services needed from the forest while maintaining a balance of old growth. Decisions must also be reached as to what mix and quantity of resources are needed to meet laws and regulations.

Some factors that influence the decisions on old growth management are:

--There may be a few wildlife species that need old growth to survive, but several that need it for optimum habitat. Without optimum habitat, the species is in an insecure situation, and catastrophic occurrence may reduce the population below a viable level.

--On the other hand, individual old growth trees as well as old growth stands are characteristically unique and provide specialized habitat.

--Old growth is renewable. If committed to it, we can reproduce it.

--Douglas-fir old growth will live for hundreds of years, but will not last forever. Stands break down from disease and insect attack. To keep old growth, we will have to grow replacement stands.

A great deal of effort is underway regarding what to do about old growth. Planning is being done that will analyze an array of alternatives. Research is underway to provide better information to guide the decision makers.

Meanwhile, a substantial amount of old growth exists and will continue to exist.

The Forest Service is not controlled by any one interest group. The decisions will be made by the land managers through the planning process, and those decisions will be reviewed and improved by future plans as better information develops.

Efforts that went into the planning and design of this conference are essential if we are to reach a consensus on this issue. Forums such as this are helpful in presenting a balanced picture and are helpful to planners and decision makers. This effort goes much further toward reaching a balance than if we went our separate ways to the halls of Congress trying to convince others that our individual positions are the right ones.

MANAGING OLD GROWTH FORESTS:
Responses by Jeff Sirmon*

Just how will the Forest Service and BLM decide how much old growth forest to manage for? Will these be national or regional decisions or will they be made on an individual forest or BLM basis?

SIRMON: I think the decisions we make are based on values and concerns we hear from all quarters. We'll look at supply, we'll look at demand, we'll look at the assessments we've made, the criteria for decision making, and all the input we can get and try to come up with a balanced decision. The initial decision making by the Forest Service will be at the regional level. Forest personnel will propose how they plan to handle the question of allocation of old growth and present an array of alternatives to me.

I must mention a problem that I haven't thought completely through yet. When you have forests coming on line at different times, how do you know what kind of decision to make for forest "A" when you haven't even examined forest "B?" I intend to address this question and see if there can't be some preliminary analysis done at various stages of planning. Just because one forest has not completed its AMS or its individual step, doesn't mean that we don't have information to make projections about forests where the planning isn't quite that far along. I intend to look broader than one forest before making a decision on the first forest.

John Crowell recently spoke at the Northwest Forestry Center of when the Forest Service and BLM accelerate old growth harvest. Is there in fact a mandate to do this? How and when would that occur in Oregon?

SIRMON: There is no mandate to accelerate old growth. There is an emphasis and some interest in looking at the economic cost of carrying old growth with the expectation that after we look at those costs, it will tell us to cut faster. But there is no mandate down through the decision channels or the budget channels to accelerate old growth cut. There is a strong personal feeling on the part of this administration to increase revenue. They look at this as carrying unnecessary inventory that is very valuable and a source of income.

Do cut quotas on Forest Service districts ever specify age and type of forest rather than just board feet?

SIRMON: The harvest plans that the districts establish are normally five-year plans. They are based on a higher level of planning; that is, they were timber management plans in the past and will be part of the integrated forest management plan in the future. The plan is based on the objective of having the forest under a regulated management scheme. The individual annual programs which the districts come up with are aimed to meet the objectives of the overall plan.

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* Transcribed comments.

We do not send down quotas by saying that you have to cut so many board feet of old growth, so many of this and the other. Those decisions are made on the ground, locally, by the ranger, the silviculturist, and the team specialist on where we should be managing vegetation. We do have some categories of live and dead and some categories of commercial thinning, but those, too, are based on the overall timber management plan or a catastrophe such as an outbreak of insects where we'd want to emphasize a harvest of dead timber.

> **I heard that the Forest Service may selective-salvage old growth timber stands from wilderness areas, once old growth has been harvested from commercial timberlands. Does the Forest Service have such a policy, and where might such logging take place?**

SIRMON: The Forest Service certainly does not have a policy, and we could not have a such a policy unless the Wilderness Act was changed. There's no timber harvest allowed inside wilderness.

> **On a national level, outputs from the national forests are supposedly guided by the Resources Planning Act goals. The RPA goals address many forest outputs but do not specifically deal with the components of the resources, such as old growth forests, as an entity. As your agency strives to exceed the RPA goals, how do you see this effort affecting the old growth resource?**

SIRMON: The determination of land management planning goals will necessarily include decisions or sub-objectives of components of the larger goal. When you want to know how many deer, how many rabbits, how many songbirds, and so forth, it just gets too detailed to know just exactly what kinds of numbers you should put on the various components.

Many of these concerns can be expressed by describing the kind of habitat you want to maintain or saying that we must have a diversity of species or a diversity of habitat. By doing that you insure automatically, based on study and research, that you will have some of these things. I don't ever see us breaking the Resources Planning Act down so fine that we would have a target number for each of the hundreds and thousands of things and critters and plants that live on national forest land.

> **That was a good speech for a forester. On old growth research, I wish you would invite all caring and concerned environmental organizations and individuals to join this effort. Our objective is the preservation of old forests and their residents, the wildlife. Are you willing to invite our participation?**

SIRMON: There's not a thing we can do these days without having public involvement, and you will certainly be a part of our planning and decision making. I have another question that deals with the fact that people don't see us responding: "You've talked, but we don't hear you."

I'd like to respond to that one too. In terms of being involved in research, the charter is open for people who want to contribute time, money and knowledge. I don't know exactly how the program will be set up so we can accommodate that; though we're making a great push to have volunteers in all aspects of our work, including research.

Now on the question whether I feel that you aren't being heard: I certainly do not. You are having an impact on decisions. In those cases where your wishes are unsatisfied, I'm sure that you're unhappy; but I can guarantee you that from my vantage point, public involvement definitely changes things. It changed things in RARE II. It influenced the recommendations that we made. It changes things when you get out with the ranger and his people on the ground on decisions he's pondering and might make.

I'll tell you why it's changing things--not just because you're being involved. The National Environmental Policy Act has changed the entire Forest Service in terms of the way we do business. It has a provision that we expose our decisions and proposed actions to the public. By virtue of this exposure, we've got to be able to answer the questions that you raise. No longer can our people on the ground, our rangers, supervisors, and others, ride out one morning and say, "I'm going to do this today, and this is the way it's going to be."

It just doesn't happen that way, because they know now that they're going to have to expose their plans and intent. If there are questions they can't answer, they know they've got to find the answers.

In the early stages of implementing NEPA, we found that we had a lot of questions we had to answer. We've added to our ranks people in all the "ologies" to answer those questions. The people we are bringing into our organization are just as hard on our managers as the people from the outside. To some degree, it's easier to be a land manager today than it was 15 or 20 years ago because your're not going to drive off the brink. I think that's healthy. I think the things we need to do now is to have the management ability and management expertise to push things to resolution. We've certainly had a lot of input and exposure, and a lot of times we get paralyzed because of all of this. Of course, those who don't want things to happen are glad we're paralyzed. Those who do want things to happen are frustrated. But I think now our management challenge is much more than our technical challenge.

Do you think it would be desirable for the Forest Service to educate the public to use less wood, recycle wood products, consider converting to an economy geared to less rapid utilization of resources?

SIRMON: I certainly do, and I think that's happening too. Maybe you've heard of some of the things we've done at the forest products lab and other places in extending the use of wood. It's an amazing story. Also, we have a very active program in reducing the amount of wood that is wasted in logging and milling. We have directional-falling and ways to cut. We have worked with sawmills here to make sure there is less loss and complete utilization of chips and bark, and there are other areas.

I think that you're going to see a lot less use of wood. The American Plywood Association is promoting a set of 16 standard plans that are based on the dimensions and characteristics of plywood. The plans are for homes ranging from about 900 square feet to 1,200 square feet. The theme is "smaller is better." If the structure of the money market doesn't change, it's going to be about the only house that people will be able to afford. Also, electronic mail, electronic newspapers, and electronic reading of things will make a dent one of these days in the amount of pulp we use.

Does the Forest Service definition of old growth include the last factor, i.e., evidence of man's activities, as subordinate? Doesn't this confuse old growth with the wilderness issue?

SIRMON: No, I don't think so. This definition of keeping man's activity subdued fits into the notion I mentioned of managing old growth. We heard this morning that if you want to manage for Douglas-fir old growth, you can't let it go to hemlock. If you don't let it go to hemlock, you have to do something. I think you'll see some of the management prescriptions formed in our forest plans that will have to describe how we plan to manage a stand for old growth and the various species. To do that means that you have to have some activity.

Let's say we have Douglas-fir in wilderness and that we've never touched it and can't get in to log it. If we don't have a catastrophe, one day it will be a hemlock wilderness. (I shouldn't make those kinds of predictions, because that's a thousand years from now in some places.)

What do you estimate the funding requirements are to carry out the interagency study of old growth that you propose? Where's the funding coming from? What guarantee do you have that the funding will be available?

SIRMON: I'm told that the funding is secure and that the '82 budget has been assured and the '83 and '84 budgets as they go forward. The '83 budget is already in the cycle. Of course, Congress can dispose, or whatever, or the administration can change its mind in the process. The '84 budget will be going in within the next few weeks.

It's up to the managers who tell people about fund allocations that this is more important than something else. I think that if we can do that, we'll get the money.

ECONOMIC ASPECTS

Speakers: **Mr. David Cox**, Economist, Mason, Bruce & Girard, Inc., Portland
Mr. Randal O'Toole, Director and Forest Economist, Cascade Holistic Economics Consultants (CHEC); Publisher, Forest Planning
Eugene

Response Panel:
Dr. J. Douglas Brodie, Associate Professor, Forest Management, Oregon State University, Corvallis
Dr. Michael Haynes, Associate Professor of Economics, Southern Oregon State College, Ashland

Moderator: **Sharon Posner**, League of Women Voters

EVALUATING THE COMMODITY VALUES OF OLD GROWTH FORESTS THROUGH THE USE OF TRANSACTION EVIDENCE, MARGINAL COST/BENEFIT ANALYSIS, AND SPATIAL OPPORTUNITY COSTS

OR

"DIVIDING THE OLD GROWTH PIE"*

David R. Cox

My assigned task today is to offer some facts and ideas about the commodity values found in the Northwest's old growth forests. Because the general public must now have some serious reservations about the economics profession, it is significant that a large portion of this conference has been devoted to discussing the economic aspects of old growth. In an age where economic predictions change rapidly and when those predictions almost never seem to be correct, I am encouraged that there is a realization of economic's role in the eventual resolution of this issue. I believe that the "dismal science" will contribute to better understanding of and equitable decisions on this issue. However, it is important to remember that the best, unbiased economic analysis in the world will not necessarily provide the "correct" answer to controversial resource-allocation issues. Final decisions about this resource will be largely settled in the political arena. But it is my hope that better analysis will be more thoroughly used by decision makers than it has been in the past.

I look at this conference as a real opportunity to examine the overall magnitude of this issue because, to date, the public agencies managing most of our remaining old growth forests have been reluctant to examine the total potential impacts of different old growth management schemes. The impacts are significant on both a regional and a local basis.

There are two general points that need to be kept in mind throughout this conference. First, my experience and contacts with a wide variety of resource managers and users leads me to believe that there is a consensus over the need to maintain some of our forests in an old growth condition. The issues revolve around the size of this resource, the relative dependence of various wildlife or plant species on this resource, and the manner in which these resources should be managed.

Second, I believe that the severe recession (depression) in the forest products industry is temporary. Demand for Northwest timber resources will intensify in the next 10 to 20 years, even though the structure of the forest products and home building industries will change. Decisions made in public land use plans in the next several years will definitely impact the long-term health of Oregon's economy; the present depression in demand should not be considered permanent.

Since it is difficult to separate commodity and noncommodity resources, and since these two terms inspire a multitude of value judgments, I need to give you my definition. I consider commodity resources those which are bought and sold in a well-established market and in which there is often a change in ownership and direct receipt or loss of income. That definition, of course, does not leave me many "commodities" to discuss.

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* Prepared paper.

Do not misunderstand me to imply that noncommodity resources have no value --they do. But the value of noncommodity resources is difficult to quantify. Although there are some economists who claim crystal-ball powers to value any resource, I believe the most reliable values are those that are developed in the market place. Those values can then be used in the form of opportunity costs analysis for noncommodity outputs. There are three major commodity values in the forest--timber, grazing and recreation. Since I have presumed others will discuss recreation, and since grazing values in old growth forests are usually low, I will focus my discussion on timber values.

Background

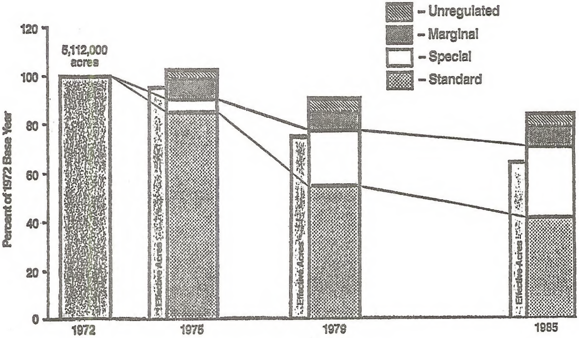
In order to understand the importance of old growth timber to Oregon's major commodity user, the forest products industry, it is important to understand the increasing dependence of this industry on public timber harvests between 1970 and 2000. It is also important to understand how recent government planning activities make those manufacturers dependent on public harvests feel rather threatened about a stable source of supply.

Contrary to the common view, the milling capacity of the forest products industry in Oregon is not declining as of the last measured date, but the size and kinds of mills are changing. The Pacific Northwest Forest and Range Experiment Station mill surveys show that, as of 1976, single shift capacity in Oregon's three large manufacturing sectors (lumber, plywood and pulp) increased about 10 percent since 1968. Competition for the "wood pie" has increased.

Most people knowledgeable about forestry in Oregon are familiar with the now famous "Beuter Report" which was released by Oregon State University in 1976. This report provided the first widely accepted forecasts of declines in western Oregon timber harvests; these declines were forecast primarily because of projected declines in industrial private timber harvests. However, the Beuter report also showed that regional harvests could be maintained if the public land agencies increased their timber harvests during the next 20 to 30 years to allow private, young growth forests to mature for harvest early in the next century. The Beuter report findings have since been confirmed by several other major reports.

These timber supply reports have caused many shock waves, but one most certainly was a vivid impression by the traditional purchasers of public timber sales that they would soon face increasing competition. The bidding patterns for public timber sales have shifted in the last 10 years. There are now more organizations trying to procure their piece of the public "wood pie." This is one of the reasons bid prices have reached their very high levels. At the same time many wood users were looking to the public lands as a source of increasing wood supply, other phenomena were occurring--land use planning and increased recognition or awareness of noncommodity resources.

The public land management, land use planning process has resulted in a gradual but steady shift of the commercial forest land base to recognize other multiple use resources. One result has been a decline in the ability of public land to increase or maintain timber harvests. As an example, work we conducted several years ago showed that in western Oregon national forests, the commercial forest land base has declined about 8 percent between 1972 and 1979. In addition, the effective potential yield of these forests has declined 25 percent, as is shown in the following chart.



Western Oregon National Forest Timber Growing Base

Actual Losses Due to Land Use Planning

The Forest Service and the Bureau of Land Management are required to calculate both short- and long-term allowable timber harvest about every 10 years. They perform this through the land use planning process mentioned above and with computer models designed to handle complex allocation problems. In the planning process, the vast majority of the existing old growth has always been included in the commercial forest land base used to compute the allowable timber harvests. When harvest calculations were made 20 years ago, it was assumed that most areas would be available for harvest in the future. Consequently, the current even-flow harvest levels (and parallel industry capacity) were predicated on this land base. The impact of withdrawing these acres from the allowable cut base will cause an immediate reduction in harvest unless intensive management or policy changes can be implemented. We are now at the point where the "wood pie" has been thoroughly sliced, chopped and claimed. I'm reminded of Rich Little's spoof about President Reagan, when the president comes up with three halves to the budget. There simply are not three halves to the old growth pie. From a timber harvest standpoint, it is now time to begin eating the last half of a pie which was cooked in 1960 and 1970.

This is an important distinction, because there is a substantial difference between creating old growth management areas from land that has not been included in the allowable cut base or from land that historically has been an integral component of the existing allowable cut base. In the first instance, existing economic activity such as jobs or income are not impacted--just the opportunity to create them. In the latter instance, existing economic activity would be directly impacted.

Because of reductions in the commercial forest land base you have just seen, because of existing federal policies, and because of potential declines in regional harvests, it is easy to see why many commodity users are very skeptical that public agencies can maintain or increase timber harvests (while maintaining the current land uses) and at the same time create a large acreage of old growth areas.

Commodity Values of Old Growth

A discussion of specific old growth values can range from a very detailed analysis of log grades to an examination of broad economic relationships and impacts. As mentioned earlier, the major commodity value of old growth timber is found in its utility for manufactured wood products.

The prices paid for old growth stumpage are generally greater than those paid for second growth timber. There are some obvious reasons for this difference. First, the logging costs for older forests are usually lower because of the large tree sizes. The fewer the number of tree pieces per acre that must be handled during the process of felling, yarding and hauling wood, the lower the cost.

Old growth timber is also valuable because these stands often contain a larger percentage of high grade logs. This varies from stand to stand and species to species. "Mother time" has served as a natural pruner of the lower branches, which allows the tree to slowly add clear, knot-free wood over the lower stem. It is this clear lower stem that also increases the scenic value of some stands.

Although there are some definite attributes which make old growth forests valuable, they also have some debits. Since these stands are overmature, they are usually dying faster than they are growing. These stands contain a larger volume of both standing and down, rotten and unusable wood. This material increases logging costs and also adds to site preparation costs. Smoke management problems in the Willamette Valley have been partially caused because of the need to burn large volumes of rotten or cull wood material which cannot be economically hauled to mills. The energy crunch is lessening this problem.

A variety of high value wood products is manufactured from high quality old growth logs. Clear boards and tight growth-ring patterns make this material very suitable for such lumber products as mill work, stair boards, telephone pole crossbars, export products, and structural lumber where clear boards are needed. The majority of the peeler and high sawlog grades are sawn into lumber or dimension products. A minor amount is used to produce clear face A and B grade plywood panels.

Value to Oregon's Economy

As I mentioned earlier, the public agencies responsible for managing old growth have not tackled an economic examination of this resource on a regional basis. Instead they have chosen to analyze it on a unit-by-unit basis, which tends to negate the total impact, until too many small decisions have been finalized.

There are numerous ways in which the present and future contribution of existing old growth forests can be appraised. In order to estimate one range of potential values, I have used the Oregon-Washington Interagency Wildlife Committee recommendations for spotted owl habitats as an acreage base. In the Region 6 Regional Plan, this wildlife committee has recommended that the older "forests be managed so that the option to provide 1,000 acres of old growth per pair (of owls) . . . be maintained." They have recommended 290 pairs on Forest Service, 90 pairs on Bureau of Land Management, and 20 pairs on other public lands. They have recommended that overstory trees be 250 years of age or older and that there be no timber harvests.

Implementing the recommendations of the wildlife committee would result in 400,000 acres of forest land set aside for old growth ecosystems. Not all of these designations would necessarily be set up in areas currently in the allowable cut base. However, initial planning activities have resulted in designations for more than the recommended number of pairs, so it is fair to use the 400,000 acre figure to give us an idea of the costs of one old growth management proposal.

Based on conversations with knowledgeable people, I estimate that the spotted owl designations would probably contain about 50,000 board feet per acre. This estimate accounts for some high elevation, lower volume stands. The 400,000 acres would contain about 20 billion board feet of standing timber. In the second quarter of 1981, the average stumpage price of western Oregon, Forest Service timber sales was $282 per MBF. Using a conservative value of $250 per MBF, the standing value of the timber alone would be $5 billion. If these designations are made then, the spotted owl and old growth values protected or preserved must be worth at least $5 billion in western Oregon alone.

It is difficult to conceptualize the magnitude of $5 billion. In order to do this, imagine you're the head of an organization or company attempting to purchase this resource to manage it for old growth values. In transactions of this type you are likely going to have to borrow the money to purchase it. Although borrowing arrangements get very complex, paying off a simple mortgage type loan at 12 percent interest over 30 years would require monthly principal and interest payments of $51,450,000. The purchasing organization would obviously need to develop a plan in order to pay for this property. This might involve such things as harvesting the timber for forest products or charging user fees to visit these preserves. The next step in deciding to purchase this resource would be to determine if your projected uses would generate enough money to cover this hefty payment.

There is another way to analyze the designation of 400,000 acres of commercial forest land as spotted owl and old growth habitat. The Mt. Hood National Forest typifies the forest land productivity on public lands in western Oregon. The Mt. Hood potential yield (which includes existing designations of standard, special and marginal land components) is 530 board feet per acre per year. Thus, the potential yield of these areas is conservatively 212,000,000 board feet each year. Of this total potential yield, anywhere from 180 to 190 million board feet in programmed annual harvest would be immediately removed from timber sale programs each year. Unless other policy changes or intensive management practices are made, this designation would result in immediate impacts.

On the other hand, failure to create old growth preserves during the next round of 10-year plans will not necessarily eliminate the option to create these preserves at a later date. There are numerous national forests where old growth forests will exist for many years under current timber management plans.

The draft Environmental Impact Statement for the Bureau of Land Management's East Side Salem District contains a good example. In the maximum timber alternative, with an allowable cut of 118.4 MMBF per year, there will be 29,700 acres of old growth forests at the end of this 10-year planning period. In the wildlife emphasis alternative there would be a harvest of 64.2 MMBF per year with 35,295 acres of old growth in 10 years.

The Mt. Hood National Forest also serves as an example. In the existing forest plan and in the "suitable" land base there will be 117,000 acres of old growth forests (200 years of age or older) 50 years from now. If the area of old growth in wilderness and other areas where logging is now allowed are counted, there will be 318,000 acres of old growth 50 years from now.

These examples are used merely to illustrate that options are available. In many instances the designation of old growth preserves could be based on an analysis of the "best" time to impose a reduction in timber harvests. That is, could the proposed reduction be better assimilated into the state's economy now or in 10 or 20 years?

Conclusions

It is difficult to offer conclusions or recommendations on an issue as complex as the allocation of our remaining old growth forests. If there were adequate commodity markets for all the resources involved, the decision would be largely consumer derived through the purchasing power and demand of the different user groups. Of course, the situation does not exist, and public officials are faced with the choice of attempting to balance the obvious commodity demands for old growth forests with the unquantified and subjective demands for the noncommodity values of the forest. In my view the commodity values of the old growth resource are tremendous; they are vitally needed in the next 20 years, and I believe they must be managed at a high level of intensity.

Although most foresters have an inherent distrust in economics, this art can greatly improve resource decisions and efficient resource use, provided it is performed before decisions are made. There is most definitely a need for a more economic impact analysis of the possible consequences of alternative old growth designation by the major federal agencies. The U.S. Forest Service and the BLM have spent considerable time examining the potential values of spotted owl management programs at the regional level but have not quantified the economic impacts of alternative designations and management strategies on the northwest's economy. This simply needs to be done, and quickly.

A second conclusion is that management of old growth areas must be intensive--we cannot afford not to optimize the use of all resources from these areas. Based on documents and recommendations of the wildlife management committee, it appears to me that there is a definite bias against man's activity in spotted owl areas. I feel that there is a definite need to thin and harvest trees in these areas along with management activity designed to increase wildlife and plant outputs. It is my belief that researched natural areas, botanical areas and wilderness areas provide a sufficient base of undisturbed natural ecosystems.

Finally, the federal agencies, during the planning process, should examine the impacts of delaying and varying the size of old growth management areas. In many instances there is not enough research and knowledge to justify the maximum preservation of old growth at this time. An analysis of the facts leads me to believe that the sense of urgency expressed over this issue is somewhat overemphasized. Decision makers can still maintain harvest levels while preserving options to protect old growth in the future as better knowledge becomes available.

ECONOMIC ASPECTS OF OLD GROWTH*

Randal O'Toole

The old growth controversy is between those who believe these forests should be protected for non-timber values and those who believe that they should be harvested and regenerated with faster-growing young timber. Many people feel that economics has little application to this controversy because a dollar value cannot be placed on many of the non-timber resources.

The belief is probably strongly reinforced by the many economic studies which, taking only timber values into account, conclude that public old growth should be rapidly liquidated and that second growth should be grown on very short rotations. Yet there are three very different questions which can be asked about old growth, only one of which is right when standing old growth values are being considered.

One question is "How fast should remaining stocks of old growth on public land allocated to timber management be liquidated?" No matter what the answer to this question, all the old growth in question will eventually be liquidated. There is a risk that some old growth values will be lost because liquidation proceeded too quickly for that value to be discovered, but that risk would be minimized by adequate old growth protection.

The second question, "How long should the rotation be for standard public forest lands?" is also inappropriate. Rotation lengths suggested generally vary between 40 and 120 years, none of which will produce any old growth attributes.

Only one question is appropriate: "How much forest land should be allocated to the production of old growth attributes?" To answer this question precisely, the value of old growth attributes given different levels of supply of old growth must be known — this would be called the demand curve for standing old growth. The value of resources competing for the land needed for old growth must also be known — that is, the demand curve for timber.

Finally, the relationship between the harvest of timber and old growth-related resources must be discovered. The production of timber on normal rotations may completely exclude the production of, say, spotted owls, but it may merely reduce the production or value of fish and recreation.

High recreation values, improvements in water quality, and habitat for rare plants and wildlife are among the resources produced by old growth. All of these may have an economic value, but there has been little research to determine what those values are. There is evidence that the existence of old growth may contribute to production of timber elsewhere. But the relationship between old growth and timber production is also unknown.

On the other hand, the costs and returns from timber production are well known. In this situation, the standard economic procedure is to see what can be discovered from known values. Then the unknown values which would be necessary for the efficient protection of old growth can be estimated. A judgement can then be made whether the other resources are worth that amount.

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* Prepared paper (copy prepared in the CHEC office, Eugene, Oregon).

Using this procedure, I will show here that a significant portion of land that the Forest Service considers "commercial" will be more valuable in an unmanaged state than when intensively managed for timber. Specifically, over 30 percent of land now being managed for timber east of the Cascades as well as in Southwest Oregon is Federal land which has a negative value when managed for timber -- that is, it is economically unsuited for timber management. Since old growth values, whatever they are, are certainly greater than zero, the best use of this land would be for the production of old growth and other natural resources.

The proportion of economically unsuitable timber land is much smaller in that area west of the Cascades and north of Douglas County known as the Douglas-fir Region. Moreover, it may be desirable to protect old growth on a cross section of forest sites, not just the low sites.

Given a reasonable range of assumptions about the demand for old growth, it appears that protection of 20 percent of high site Federal forests may be efficient if the value of old growth attributes today is between $340 and $690 per acre per year. There is evidence that old growth values could easily be this high.

Economics and Society

Before going into detail, I would like to say a few words to those people who are not familiar with economics, and who, therefore, are probably distrustful of it. Especially in environmental issues, most people's impression of economics is heavily colored by the frequent equation of "economics" with "profits" and the media portrayal of "economics vs. ecology."

"Economics vs. ecology" is actually a contradiction in terms. Both words come from the same Greek root, "oikos," meaning house. Ecology is literally "study of the house," and economics is "management of the house."

Ecologists study our house -- the spaceship Earth -- and discover relationships between different organisms and what will happen when one of those organisms -- people -- tries to manipulate others. Economists look at those relationships and suggest ways to manage them better. "Better" to an economist means more efficiently -- getting the "biggest bang for the buck" (or acre, or tree, or hour of labor) -- and more equitably -- meaning those getting the benefits are paying the costs.

This paper is an example of this relationship between ecologists and economists. In it I will use recent old growth research by forest ecologists to discover how public forests might be managed better to produce both old growth resources and timber.

Perhaps a source of friction between ecologists and economists is that, unlike ecology, the science of economics is highly anthropocentric. To an economist, the world is important only because it is important to people. A tree cannot have any value to itself, but only if it is valuable to people.

That doesn't mean that a tree is only valuable if it is cut down and made into wood products. A standing tree can be valuable to people just where it is, even if no mechanism exists for someone to profit by it.

Economists call a good which can be made profitable a market resource. A good which has value but which cannot be turned into profit is a non-market resource. Most old growth values are non-market resources, resources which would disappear if all forest lands were in private ownership. It is the primary legacy of the Forest Service to produce those resources.

National Forest Economics and the Law

Before presenting an economic analyses of old growth, I would like to briefly review the law on public forest economics. Although I will be speaking mainly with reference to the Forest Service, much of what I will say applies also to the Bureau of Land Management and other public land agencies.

Congress has spoken only briefly to the economics of national forest management, but its few words are highly significant. There are three laws of particular importance: the Organic Adminstration Act of 1897, the Multiple-Use Sustained-Yield Act of 1960, and the National Forest Management Act of 1976 (NFMA).

The first of these regulates the sale of national forest timber, and though it was superseded by NFMA the language remains the same. The law authorizes the Forest Service to sell timber "at not less than appraised value." Forest Service regulations correctly define "appraised value" as "fair market value," which in turn is given the standard definition by the Forest Service Manual of the price which a buyer and seller would agree upon provided neither were compelled to buy or sell.

This clearly defines a lower limit to the price which the Forest Service can sell timber. In some places that limit will be determined by local market values of timber. But the Forest Service must also consider management costs, since no rational producer would sell wood for less than the cost of growing that wood. Yet the current Forest Service appraisal system fails to adequately consider either market values or internal costs of management.

The Multiple-Use Sustained-Yield Act requires the Forest Service to manage all forest products on a sustained yield basis. In particular this means that national forest timber cannot be "mined," or harvested with no intention of growing a future stand of trees. Timber mining on private land is still legal in most states, including Oregon on low site forest lands, but it is out of reach to the Forest Service.

The Act also defines "multiple use" as management to:

> best meet the needs of the American people; . . . with consideration being given to the relative values of the various resources, and not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output.

This can be interpreted to mean "manage the national forests efficiently and equitably considering both market and non-market values."

The National Forest Management Act requires the Forest Service to prepare management plans for each of the national forests. Section 6(k) of that Act specifically directs the Forest Service to

> identify lands . . . which are not suited for timber production, considering

> physical, economic, and other pertinent factors . . ., and [to] assure that . . . no timber harvesting shall occur on such lands for a period of 10 years.

Every ten years the land may be reviewed to see if changing conditions have made it suitable for timber production. If so, the land can be returned to timber production.

Significant here is the distinction between "timber production" and "timber harvesting," especially in light of the sustained yield requirement. Timber production is more than just the harvest of old growth, it is the sustained production of wood. Even if old growth can be profitably mined, the land on which it stands is not suited for timber production unless it can be efficiently managed for timber on a sustained yield basis.

If these interpretations of the law are correct, then conflicts over the economics of old growth harvesting are mainly limited to a few national forests in the Douglas-fir Region. Elsewhere, it can be shown that much of the old growth which remains today is on land which is not economically suited for timber production.

The Economics of National Forest Management

For a forest manager who is not required to manage on a sustained yield basis, the question of harvesting old growth is a simple one: is the value of the wood greater than the cost of removing it from the forest to the mill? In all but a very few extreme cases, the answer is "yes."

For example, the cost of harvesting timber was compared with the value of that timber in each of 177 Oregon roadless areas in CHEC's research paper, **An Economic View of RARE II** (O'Toole, 1978). Logging costs, road construction costs amortized over a twenty-year period, and fire management costs over and above the costs of protecting roadless areas from fire were all included in the analysis.

These roadless areas, which total about three million acres, have remained roadless because they represent the least accessible land and least valuable timber in the national forests. Yet only twenty areas, totaling about 104,000 acres, lack any timber at all and only 31, representing 515,000 acres, have timber which is more expensive to log than the timber is worth.

For the manager who must grow timber on a sustained yield basis, the question of which forests to manage becomes more complicated. After harvest, the land must be reforested and timber grown again. Efficient management is determined not by comparing the value of timber cut today with the costs of removing it, but the value of timber cut sometime in the future with the costs of growing, managing, and ultimately harvesting it.

This is called a "bare ground" analysis, since it is assumed that the initial state is bare ground needing reforestation. This is the time when the present net worth is likely to be lowest, and if it is negative no rational landowner would take the steps necessary for reforestation. The value of managing bare ground for a sustained yield of timber is called the "soil expectation value."

To determine the soil expectation value, it is necessary to convert future dollars to present day dollars. Just as Canadian dollars aren't the same as American, future dollars aren't the same as dollars today. Even without inflation, a dollar ten years from now is worth less, to most people, than a dollar today. The standard "rate of exchange" -- a method of converting future dollars to present dollars -- is called discounting.

After selecting some discount rate, dollars n years in the future are reduced by that rate n times. A dollar next year is discounted once, a dollar two years from now is discounted twice, ten years from now ten times, and so forth. If a zero percent discount rate is used, then all the dollars are worth the same — but that fails to reflect reality since both people and societies discount the future.

A bare ground analysis for twelve of Oregon's thirteen national forests was reported in CHEC's research paper, **A New Reality: Timber land suitability in Oregon national forests** (O'Toole, 1979). Three different discount rates were used: 5, 6-7/8, and 10 percent. The study used current timber prices projected to increase at rates suggested by the Forest Service's 1980 RPA Assessment.

At 5 percent, the study found that most Oregon national forest land was pretty much suited for timber management. About two-thirds of the Wallowa-Whitman and ten percent of other Eastern and Southwestern Oregon national forests are unsuited, but nearly all Northwestern forest lands are suitable.

At 6-7/8 percent, over 90 percent of Eastern Oregon forests and two-thirds of Southwestern Oregon national forests are unsuitable for timber management. Still, most -- 80 to 90 percent -- Northwestern Oregon forests are suitable. At 10 percent, however, nearly everything is eliminated.

Which discount rate is correct? Obviously, much depends on the answer to this question. The discount rate is the price of capital, and we can't just pick the rate we like, anymore than we can pick the price of gasoline or groceries.

Managing the National Forests as the Industry Would

Professor Raymond M. Mikesell, here at the University of Oregon, looked at the question of how public officials should determine the correct discount rate. After reviewing 150 references on the subject, he concluded that

> the discount rate [for public timber management] should be determined by the appropriate cost of capital in the logging industry on private forest lands. . . [This will] prevent the public sector from transferring capital from higher-yielding to lower-yielding investments." (Mikesell, 1977)

In other words, if private timber owners use a seven percent discount rate and the Forest Service uses a four percent rate, investments will be made in low productivity public forest lands at the same time that the industry lacks capital to invest in its superior lands.

This is exactly what is happening today. The Forest Service is spending thousands of dollars per acre managing land which is not capable of producing 50 or, in some cases, even 20 cubic feet of wood per acre per year. Meanwhile, the timber industry is ignoring investments on private land which, if properly managed, could produce over 100 cubic feet per acre per year.

The Forest Service recently decided to use a four percent discount rate to test the efficiency of its management activities. According to CHEC's surveys of nearly a dozen corporate timber landowners, the rates they use range between six and ten percent. The rate recommended by the Federal Water Resources Board, 7-3/8 percent, seems to be about right. If the Forest Service insists on using four percent, the national forests will continue to be inefficiently managed.

Some people suggest that, since the law requires reforestation of forest land after harvest, reforestation costs must be considered a cost of harvesting rather than a cost of growing a new crop of trees. This is illogical, first of all because the law was created because Congress (or in the case of private lands, state legislatures) wanted to insure that the investment in future stands would be made.

More importantly, it certainly does not reflect industry practice. Private corporations make minimal attempts to reforest land which produces, say, 50 to 80 cubic feet of wood and almost no attempts to reforest land which produces under 50 -- after all, Oregon and Washington forest practice rules requiring reforestation exempt such land.

If Forest Service practices differ greatly from industry practices, public forest management will be inefficient. While the Forest Service is spending thousands of dollars to reforest some harsh, dry site in Southern or Eastern Oregon, thousands of acres of good private lands in Western Oregon lie fallow for lack of capital to reforest them. The result is less wood production, fewer jobs, and greater environmental impacts on public lands.

Many people feel confusion at this point because of the jobs issue. It might be worthwhile, they feel, to lose money on national forest management because of the jobs that are created.

But are any jobs really created? Or are they really just being transferred from one part of our economy to another? If the money which is being spent on low site national forest lands were spent on more efficient projects elsewhere, as many or more jobs could be created without losing any money.

In any case, using seven percent as the approximate correct discount rate, CHEC's research indicates that most national forests outside of the Douglas-fir Region (Western Washington and Northwestern Oregon) will lose money in the long-run. Much of the land in, perhaps, 110 of the 118 national forests is just not suited for sustained yield timber production.

These results are similar to those of Hyde (1980), who concludes that site IV and V lands in the Douglas-fir Region are not economically suited for timber management. His review of current management in this Region shows that, while the timber industry is efficiently managing its land, the Forest Service is very inefficient. According to Hyde, removal of the low site lands from the public timber base and increased investments into the high site lands would double timber production and triple forest land withdrawals.

The RARE II study mentioned above and CHEC's "New Reality" paper provides a comparison of the results of a bare-ground analysis a study of the benefits and costs of simply harvesting the old growth. When only the benefits and costs of removing the old growth are considered, all but 620,000 of the three million RARE II lands in Oregon are valuable for timber cutting. On the other hand, when the costs and benefits of managing the second growth are considered using a seven percent discount rate, over two million acres -- nearly two-and-a-half times as much -- are unsuited for timber management.

Timber Land Suitability and Sustained Yield

After looking at the relative benefits and costs of harvesting old growth, and those of growing and harvesting a managed second growth stand, it is seen that any old growth timber stand will fall into one of four cases.

In the first case, it is possible that the net value of cutting old growth is positive, and the net value of managing future timber is positive. Then, ignoring non-timber values, the old growth should be cut and the land managed for timber.

Second, it is possible that the value of cutting the old growth is negative and the value of managing future timber is negative. Then the old growth should not be cut nor the land managed for timber.

But what if the value of old growth is negative yet the value of managing future timber is positive? In this third case, timber management can't take place without cutting the old growth. If the net benefits of managing on a sustained yield basis outweigh the costs of cutting the old growth, then the old growth can be cut and in the long-run the investment will be justified. Examples of this situation, though rare, have been found in some of Oregon's roadless areas.

Finally, there is the most intriguing and more common possibility, that the value of cutting the old growth is positive but the value of managing future timber is negative. As previously indicated, a lot of land falls into this category. The same criteria as before could be tentatively applied: if the net value of cutting the old growth is greater than the cost of managing second growth, then it is worthwhile to cut.

As soon as the old growth is gone, however, the picture changes drastically. Then there is no longer any question: the return from investing any money into reforestation and management is definitely negative. A private landowner might simply let the land go for taxes, or perhaps subdivide it and sell it to people who want to get back to the rural life. This frequent occurrence is called timber mining.

But sustained yield requirements forbid mining of old growth from Federal forests. The Forest Service is also required, each planning period, to examine its timber land base and determine if any lands are not economically suited for timber management. If there are any, says the National Forest Management Act, "no timber harvesting shall occur on such lands."

When the old growth is gone, the Forest Service must obey NFMA and withdraw the land from timber harvest. Then there is a dilemma: if the Forest Service knows today that it is cutting old growth from land which will then be declared economically unsuited for timber harvest, it is violating the sustained yield principle.

But if it cuts the timber and then keeps the land in timber management, it is violating the NFMA requirement to withdraw economically unsuitable land. To obey both of these requirements, the Forest Service must withdraw old growth from the timber base if the costs of managing the land on a sustained yield basis exceed the returns.

Unsuitable Land and Old Growth

It appears that much, if not most, of the old growth in Eastern Oregon and Washington as well as Southwestern Oregon is not suited for timber. Leaving it as old growth may be the highest and best use of that land. This result also applies to Alaska, much of California, and the entire Rocky Mountains. In these national forests, there may be sufficient old growth on unsuitable lands to meet all the requirements of wildlife, recreation, and other non-timber resources.

In Western Washington and Northwestern Oregon, a far smaller portion of Federal forest land — especially low elevation Douglas-fir forest land — is economically unsuited for timber management. CHEC's research indicates that it is well under 20 percent in Northwest Oregon, and that mainly consists of high elevation land.

Using Hyde's (1980) and the industry's standard that site IV and V lands are generally unsuited to timber production, comparative figures can be developed from Pacific Northwest forest survey data. This indicates that the potential productivity of the Northwest's forest lands, assuming extensive management and that most "other private" land is not available for timber management, is about 3.5 billion cubic feet or 15 billion board feet. Intensive management could increase this to perhaps 20 billion cubic feet, which is slightly more than current harvests.

The removal of all Forest Service and Bureau of Land Management site IV and V lands would reduce the land base by almost 30 percent but would reduce the productive capacity by only 20 percent. The acreage distribution of this low site land is shown in table one.

Table One
Acreage and Percentage of Low Site Forests
on Federal Land in the Pacific Northwest

Region	FS and BLM Site IV & V (m acres)	Percent Share	Total Forest (m acres)	Percent FS & BLM IV & V
Northwest Oregon	1,390	13	7,506	19
Southwest Oregon	2,095	19	6,126	34
Eastern Oregon	4,097	37	10,820	38
Western Washington	919	8	6,826	13
Eastern Washington	2,472	23	8,308	30
Total	10,973	100	39,586	28

Again, the proportion of low site lands is especially low on the west side, particularly north of Douglas County. Moreover, most of this is in the higher elevations. There still remains the question of low elevation Douglas-fir, which except in a few extreme cases is suited for management on a sustained yield basis when only timber values are considered.

It may seem that allocation of several tens of thousands of acres of unsuitable low site land to non-timber uses would be sufficient to produce all old growth values needed. Yet many biologists believe that it is important to have a range of forest types, classes, and geographic areas in old growth -- including high site Douglas-fir.

Economic Values of Standing Old Growth

Here the question of standing old growth values verses old growth timber values needs to be specifically addressed. Many non-market values of old growth have been discussed by other conference speakers, but it would be worthwhile to review them here to see how they fit into an economic view.

First, there are those attributes of old growth which are directly valuable to people. This includes all the recreational and spiritual values of old growth. An important example is the Indian tribes of the Pacific Northwest, many of which regard old growth Western red-cedar as an integral part of their religion.

In addition, old growth trees can be made into high quality lumber and other wood products. As old growth becomes more and more scarce it is not inconceivable that a few specialty mills will begin to produce products from old growth trees and pay extremely high prices for old growth.

Second, there are those attributes of old growth which are indirectly valuable to people. These include the habitat for plants and animals which depend on old growth forest environments. These are important because people like to view such plants and animals.

In addition, old growth forests have an effect on water quality: large trees, falling in streams, will create pools which filter sediment and provide fish habitat. Old growth also provides a valuable baseline for research on forest productivity and ecology.

A special category of indirectly valuable resources relates especially to timber production. Old growth may have positive effects on the productivity of forests in general. If so, it is particularly important to protect some old growth on high site forest lands. Several examples of such relationships have been documented.

For example, natural old growth forests provide an undisturbed gene pool to be available in case current tree improvement programs backfire in some way. Old growth also provides habitat for certain plants, particularly a form of lichen, which contribute to soil fertility by fixing nitrogen.

Old growth-dependent wildlife may also contribute to timber production. Certain species of woodpeckers, for example, need large snags which can only be found in old growth forests. Living on a diet of insects, these woodpeckers dampen the fluctuations of the populations of many pests. The flying squirrel, which needs old growth forests for survival, may be the main natural mechanism for the dispersal of the mycorrhizal fungus which Douglas-fir needs to grow.

These special functions of old growth may limit total production of timber from the Northwest. Liquidation of all old growth could lead to a decline in average productivity of, say, ten percent or more, whereas protection of five percent of the forest as old growth might actually result in higher total productivity. Research into these functions might be most significant, since they directly relate to timber -- a market resource -- and only the relationships between them and timber productivity need to be found to show that a certain percentage of old growth should be protected.

Finally, mention must be made of the unknown attributes of old growth. It was only a few years ago that old growth was commonly held to be a "biological desert." A few years more research may reveal important additional economic benefits provided by old growth. In light of this uncertainty, if a mistake is to be made it should be on the side of conservation.

Economic Analyses of Old Growth

Due to a lack of data, little economic work has been done on this subject. While progress has been made in several fields, I have yet to see economically sound documentation of both the non-timber resource values and the relationship between those resources and the cutting of timber.

Dr. Richard Hartman, of the University of Washington, considered the question of when to harvest timber when the standing forest has value (Hartman, 1977). He concluded that it is easily possible for standing values to be high enough to lengthen rotations beyond normal.

If this is true, however, by how long will rotations be prolonged? Calish, Fight, and Teeguarden (1978) tried to answer this question by assuming certain relationships between timber and other resources and using a range of values for those other resources.

For site II Douglas-fir forests, they found that the optimal rotation age is 36 years when only timber values are considered. Using values of $5 to $500 per unit for non-game wildlife and visual quality — resources which, they assumed, particularly depend on long rotations — they found that optimal rotation length would be increased by no more than 50 percent.

Yet a 54-year old forest will not produce any more old growth attributes than a 36-year old one. So it is concluded, as I suggested earlier, that increasing the rotation length of public forests in general is not an efficient way of producing old growth attributes.

Calish, et al, only considered extensive management regimes which included no intermediate harvests. Today many biologists believe that old growth conditions can be best created through several thinnings early in the rotation. These thinnings will significantly add to the economic viability of long rotations -- not enough to make long rotations worthwhile in general, but enough to bring their cost, perhaps, within reach.

Old Growth Management

Three alternative management schemes can thus be envisioned for any acre of old growth on public lands. First, there would be a standard forest regime under current laws and regulations. This alternative, which will be referred to as "normal rotation management," would produce timber but no old growth attributes.

Second would be maintenance of old growth conditions, perhaps with occasional cutting and leaving of a few trees to maintain old growth conditions. This alternative, referred to as "protected" or "dedicated" old growth, would produce old growth attributes but no timber.

Finally, timber could be managed on an old growth rotation. While both timber and non-timber resources would be produced, this system would be very land intensive: under an management regime which reaches an old growth state at age 200 and is harvested at age 300, only one out of three acres will be in an old growth condition. This means that three acres of land are necessary for each acre of old growth desired. This alternative will be referred to as "long rotation old growth."

The soil expectations values of these three alternatives can be compared using the yield tables of various national forests with associated management costs and returns. Tables exist for both intensive management regimes and for old growth rotations. A fixed annual custodial cost and no timber revenue will be assumed for the standing old growth alternative.

For this study, I have selected the yield tables of the Siuslaw National Forest for low site II (site index 160) and medium site III (site index 140) land, and those of the Siskiyou National Forest for high site IV land (site index 120). Table two shows the results of a bare ground analysis for each of these forests.

Table Two
Soil Expectation Values of Various Sites
Under Three Management Regimes

- - - Description of Stand - - -		- - Soil Expectation Value in Dollars - -		
Site index	Length of rotation	4 percent	7-3/8 percent	10 percent
120	(no harvest)	-50	-27	-20
120	90	-90	-330	-410
120	300	-350	-420	-490
140	(no harvest)	-50	-27	-20
140	70	260	80	10
140	300	220	60	10
160	(no harvest)	-50	-27	-20
160	70	420	190	30
160	300	270	90	10

While these results may not be typical of all Douglas-fir forests, they demonstrate a range of possibilities. On the low site, the dedicated old growth alternative appears superior or competitive with the others, exemplifying Hyde's (1980) conclusion regarding site IV land.

On the middle site, the long rotation is competitive with the normal management regime at the higher discount rates. This is because the Siuslaw yield tables call for heavier than normal thinnings in an old growth regime in order produce old growth characteristics sooner. Meanwhile, the opportunity costs of either old growth alternative are considerably higher on the high site.

A fact to remember about the dedicated old growth alternative is that the opportunity cost includes not only the present soil expectation value but the value of the current inventory which will be foregone, assuming that the land is economically suited for timber management.

While table two makes long rotations appear more competitive with normal management than old growth protection, it must be remembered that old growth attributes will not appear in a long rotation for 200 years. They will then last for 100 years until the timber is harvested. Each dollar's worth of yearly old growth attributes will have a present value, in year 200, of about $13.50. Discounted at 7-3/8 percent, the annual value of standing old growth would have to be over $100,000 for the present value to be $1.

It may be, as suggested by proponents of ecosystem management, that there is some benefit in maintaining stands of trees between normal rotation age and old growth. This so-called "mature" timber would be absent in a fully regulated forest along with the old growth. The benefits from mature timber would be smaller than the value of the old growth, if only because recreation and scenic values are lower in stands in smaller trees.

The Douglas-fir Region may now be considered as a whole to determine the proportion of land which might be best retained in an old growth state. This information will be valuable for decision-makers if it is important to protect a cross-section of sites as old growth rather than merely low sites.

After subtracting the low site Forest Service and BLM land, the Douglas-fir Region -- Western Washington and Northwestern Oregon -- still includes about twelve million acres of forest land capable of producing about eight billion board feet per year. This is close to 20 percent of the national timber supply. High site federal lands contribute nearly 2.5 billion board feet of this productive capacity.

The Demand for Standing Old Growth

As the supply of old growth diminishes, the value of an acre of old growth increases. A graph showing this relationship is called a demand curve. What would the demand curve for standing old growth look like? Although there are many old growth values, each with their own demand curves, it is easiest to think of a single good called "standing old growth" for which there is one demand curve. The shape of this curve can be estimated based on what little is known about old growth.

When the Northwest was almost completely covered with old growth forests, early white settlers regarded the forests as less than useless, and started huge fires to clear land for cities and farms. Standing old growth has a negative value, then, when it occupies all of the native forests.

The national forests were created to protect what was regarded as a diminishing resource -- not old growth forests, but simply forests. Early Forest Service officials saw as their goal the replacement of all the old growth with second growth. This attitude went practically undisputed until the 1950s, so it appears that standing old growth has zero value when it occupies, say, between 50 and 80 percent of the forest.

Agitation for wilderness legislation began in the 1950s, but it was not until the 1970s that scientific research began to support public demands for protection of old growth. So standing old growth has a small but increasing value when it occupies between 20 and 50 percent of the forest.

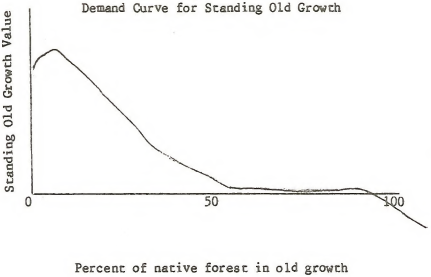
When the percentage of old growth becomes small enough, the value of an acre begins to increase sharply. The supply of old growth becomes small enough that recreationists will go out of their way to see it, populations of old growth dependent plants and animals begin to reach minimum viable limits, and so forth. For the same reason, stumpage values of Pacific Northwest old growth have increased sharply as the supply diminishes.

At some point, the per acre value may peak out and then fall. This would happen when there is no longer enough old growth to support minimum viable levels of plants and animals. The benefits provided by old growth for water quality and forest productivity would similarly become negligible. Only the recreation values would remain.

Using the spotted owl as an indicator species, this point might be reached when old growth reached 3-1/3 percent [(500 owl pairs at minimum viable levels times 1,000 acres/pair)/15 million acres total forest] of the native forest. This is about 6 percent of the Federal timber base in the owl's range.

A demand curve based on these assumptions is shown in figure one.

Figure One
Demand Curve for Standing Old Growth



The Cost of Standing Old Growth

The supply for standing old growth curve is much easier to derive. It is equal to the marginal cost of protecting an acre of timber, which is the timber value foregone when that acre is withdrawn from the timber base.

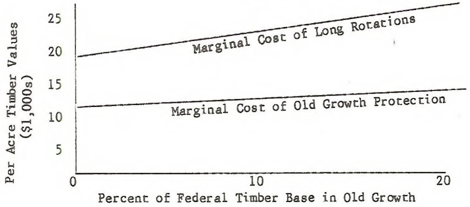
The high site Federal lands average site index 150, mid-way between the medium and high indices above. The major opportunity cost of dedicating land to old growth is the value of the standing inventory, about $12,500 per acre.

The major cost of long rotations is the difference between soil expectation values of short and long rotations, or about $70 per acre. This cost must be increased by a multiplier to take into consideration the cost of waiting 200 years for old growth values and the fact that three acres are needed for every acre of old growth.

If mature timber between normal rotation age and the time it becomes old growth has no particular value, then the multiplier is about 4.5 million at a 7-3/8 percent discount rate. If mature timber is worth 25 percent of old growth, the multiplier is only 264. If mature timber is worth half of old growth, the multiplier is 130. Using the 25 percent figure, the cost of long rotations is about $18,500 per acre of old growth, or somewhat more than old growth protection.

Adams and Haynes (1980) estimated that the elasticity of demand for national forest timber in the Douglas-fir Region is -1.6. As supply is reduced by 1.6 percent, prices increase by one percent. The cost of managing an acre of site index 150 land is roughly half the gross stumpage value, so the increase per percent reduction in supply should be about 1.25 percent over net values. Marginal cost curves are shown in figure two.

Figure Two
Marginal Cost of Old Growth Management in the Douglas-fir Region



It is possible that the demand curve in figure one is entirely below the supply cost curve in figure two. In that case, management of old growth on high site Federal timber land would not be efficient.

Alternatively, the two curves may intersect in the vicinity of, perhaps, 2 to 20 percent of the Federal timber base. While the true value of old growth attributes is unknown, the current value which old growth must have to make its protection efficient can be determined.

Table three shows the per acre cost of maintaining 2.5, 5, 10, and 20 percent of the Federal timber base in old growth using long rotations or old growth protection.

Table Three
Alternative Old Growth Management Plans

Plan Type	Federal Timber Base in Old Growth (%)	Reduction in Federal Timber Yields (%)	Cost/Acre ($1,000s)
Protection	2.5	2.5	12.9
Protection	5.0	5.0	13.3
Protection	10.0	10.0	14.1
Protection	20.0	20.0	15.6
Long rotation	2.5	3.75	19.4
Long rotation	5.0	7.5	20.2
Long rotation	10.0	15.0	22.0
Long rotation	20.0	30.0	25.4

The low apparent cost of long rotations is deceiving. As previously mentioned, values of old growth produced in long rotations must be discounted to the present. Assuming that mature forest values are half those of old growth forests, old growth must produce $44 annually in order to get one dollar of value today.

According to the best estimates I have available, about 30 percent of the high site Federal forest land in the Douglas-fir Region is still in old growth. This would be reduced by 92, 83, 67, and 33 percent, respectively, if 2.5, 5, 10, or 20 percent of Federal timber were in old growth. Present and annual values, assuming a 7-3/8 percent discount rate, of standing old growth needed to make adoption of any of these three plans desirable are listed in table four for a range of elasticities of demand for old growth attributes between 0.1 and 5.

Table Four
Present and Annual Values of Old Growth
Needed to Make Protection Efficient

Plan Type	% Old Growth	- - Present Value - - ($1,000s)				- - Annual Value - - (dollars)			
Elasticity		0.1	0.5	1.0	5.0	0.1	0.5	1.0	5.0
Protection	2.5	1.3	4.5	6.7	10.9	90	340	500	800
Protection	5.0	1.4	5.0	7.2	11.4	110	370	530	840
Protection	10.0	1.8	6.0	8.4	12.4	140	440	620	920
Protection	20.0	3.6	9.4	11.7	14.7	270	690	860	1080
Long rotation	2.5	1.9	6.8	10.1	16.4	140	500	750	1210
Long rotation	5.0	2.2	7.6	11.0	17.3	160	560	810	1280
Long rotation	10.0	2.9	9.4	13.2	19.4	210	690	970	1430
Long rotation	20.0	5.9	15.2	19.1	23.9	430	1130	1410	1760

The present values in this table were derived using the following formula:

$$PV = \frac{[(OC)\ (1 + (2dT/ET))]}{1 + (dO/EO)}$$

where: PV = the present value of old growth today needed to make protection of a portion of the Federal timber base as old growth efficient;
OC = the marginal cost of protecting an acre of old growth;
dT = the percent reduction in Federal timber production;
ET = elasticity of demand for timber (multiplied by 2 since timber revenues are assumed to be twice net revenues);
dO = the percent reduction in old growth from current levels; and
EO = the elasticity of demand for old growth attributes.

The numerator produces the values shown in the last column of table three.

The cost of long rotations is about 50 percent greater than the cost of protecting existing old growth. However, this is very sensitive to assumptions about the values of mature timber. If mature timber is worth more than about half the value of old growth, then the cost of long rotations would drop below the cost of protecting existing old growth.

Because the supply of old growth attributes is rapidly diminishing, and there are no substitutes for many of them, demand should be fairly inelastic. If the elasticity for old growth attributes is 0.5, their annual value to society need only be $340 to $690 for allocation of 2.5 to 20 percent of the high site Douglas-fir timber base to old growth to be efficient. If demand for old growth attributes is very inelastic, annual values need not even be this high.

Notice that, assuming an elasticity of 0.5, doubling the supply of old growth from 2.5 percent to 5 percent increases the cost per acre by only 9 percent. Doubling again from 5 to 10 percent increases the cost by 19 percent. Doubling to 20 percent increases the cost by 57 percent.

So as benefits from old growth are being significantly increased, the marginal cost of protecting old growth increases only slightly. An economist would say that there are increasing returns to scale.

Returns to scale become constant only after more than 35 percent of the Federal timber base is dedicated old growth. At an elasticity of demand for old growth of 1.0, returns to scale are constant when 25 percent of the Federal land base is protected as old growth.

I am not suggesting that constant returns to scale is an appropriate goal for public forest managers. But if the known values of old growth could be agreed to be worth at least $370 — the five percent old growth level -- then the unknown values need only be worth 86 percent more to make saving four times that amount of old growth efficient.

In other words, the fact that old growth values exhibit increasing returns to scale at low levels of old growth management indicates that -- if old growth is worth saving at all — it is probably worth saving 15 to 25 percent of the high site Federal land base as old growth.

For this to be realistic, however, the value of old growth today must equal or exceed the values in table four. Do current old growth values fall between $340 and $690 per acre per year? The value of one resource which old growth may benefit is well known: timber. What if complete old growth liquidation were to reduce long-term timber productivity by ten percent, while productivity would be maintained by dedication of, say, 5 percent of the base as old growth?

Assuming net timber values of $250 per thousand, the annual value of maintaining an acre of old growth then exceeds $500 [10% of 220 cubic feet per acre in a managed forest of site index 150, times 19 productive acres for every old growth acre, converted to board feet using a board foot:cubic foot ratio of 5]. Wildlife, recreation, and other values could add significantly to this amount.

Long rotations appear reasonable only if mature forest values are worth one-fourth to one-half or more of old growth values. Considering that the timber productivity values (nitrogen fixing plants, habitat for woodpeckers, etc.) are largely absent in mature forests, and that the recreation and water quality values of an old growth forest are far higher than in a mature forest, this seems unlikely. Old growth protection is far more economically efficient than long rotations.

It is sometimes argued that long rotations are needed because old growth Douglas-fir forests will eventually be replaced by western hemlock climax forests. However, the typical 200 to 300 year old Douglas-fir stand will not reach the climax stage for 500 or more years. This is regarded by Forest Service silviculturalist Jerry Franklin as such a long period of time that it is unimportant.

If mature forest values are important, long rotations may be efficient simply to produce those values. Such rotations would be on the order of 160 to 200 years long. The mature forest, being more transient than old growth, cannot be managed by dedication of existing stands.

The inefficiency of long rotations for old growth shows that, just as the demand for old growth is inelastic, so too is the supply. In other words, once the old growth is gone, it will be very difficult — perhaps completely infeasible — to grow it back again. Decision-makers, then, should err on the side of conservation.

Up to this point it has been assumed that all high site Federal forest land is uniform with respect to costs of and returns from timber management. In fact, there are important differences which can help in deciding which lands should be allocated to old growth.

The costs of developing roadless lands greatly decreases the opportunity cost of managing those lands as old growth. In addition, some forests have land which is not physically suited for the multiple entries required in intensive thinning regimes. Since early thinnings make an important contribution to soil expectation value, the opportunity cost of protecting old growth on lands not suited for thinning would be significantly lower.

Conclusion

Using timber costs and values only, efficient national forest management will result in allocation of significant acreages of land to non-timber management outside the Douglas-fir Region. This may be sufficient to protect most old growth attributes in Southwest Oregon and east of the Cascades.

In the Douglas-fir Region and other parts of the west where timber values are very high, there are still valid economic reasons for protecting a cross-section of old growth. Among these are the long-term research values of old growth, the possible relationships between old growth and forest productivity in general, and additional values which are still unknown.

While these values are not quantifiable, a sensitivity analysis can determine the values which would be necessary for old growth management to be efficient. Using a reasonable range of demand curves, it seems likely that it would be efficient to dedicate 20 percent or more of the Federal timber base to old growth, particularly if some of the lands protected were those for which timber management is especially costly. In plain English, if it is worth saving any acres at all, it is worth saving about 20 percent.

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O'Toole, Randal (1978). **An Economic View of RARE II.** Cascade Holistic Economic Consultants, Research Paper #3, Eugene, Oregon. 55 pp.

______________ (1979). **The New Reality: Timber Land Suitability in Oregon National Forests.** Cascade Holistic Economic Consultants, Research Paper #4, Eugene, Oregon. 19 pp.

In addition, the data in table one and estimates of current levels of old growth on Federal land were derived from the following Pacific Northwest Forest and Range Experiment Station resource bulletins:

Timber Resources of Southwestern Washington (#15, 1965)
Timber Resources of Central Oregon (#24, 1968)
Timber Resources of the Olympic Peninsula (#31, 1969)
Timber Resources of Central Washington (#45, 1973)
Timber Resources of the Inland Empire (#50, 1974)
Timber Resources of Blue Mountains (#57, 1975)
Timber Resources of Southwestern Oregon (#72, 1978)
Timber Resources of West Central Oregon (#76, 1978)
Timber Resources of Northwestern Oregon (#82, 1979)

Changes in reporting methods and survey techniques -- not to mention recent timber harvesting — increase the reliability of the more recent bulletins.

I would like to thank Bahram Adrangi and Doug Brodie for reviewing this paper and making many critical suggestions. I alone remain responsible for any errors.

ECONOMIC ASPECTS: Response by Dr. J. Douglas Brodie*

Dave Cox basically established that the reasonable commodity value for old growth timber is about $12,500 per acre; that is, the value of the standing timber on an average acre of old growth amounts to about $12,500. Randy O'Toole more or less agreed with that value.

In working out a response to papers like these, you come up with some value range that you'll object to even if the participants are outside that range. I gave myself a liberal range--from $10,000 to $20,000 per acre primarily depending on the quality of old growth that we're talking about.

Particularly in Randy O'Toole's talk we went through a wide range of old growth qualities. Generally, as we expanded the supply of old growth protected, particularly the eastern Oregon portion, we would be protecting areas of more scattered timber or areas of smaller trees--less superlative stands of old growth.

Mr. O'Toole said that he didn't disagree very much with what Dave Cox said. And, basically, Dave Cox said that old growth is a very valuable resource, it's a difficult allocation problem, and we should be careful about allocation decisions. That's a difficult point of view to disagree with.

Mr. O'Toole said that Mr. Cox probably wouldn't disagree with him either, except on one particular point. When Mr. O'Toole's review paper came, it was 30 pages long. My reaction to it was, "How could he talk so long on this topic?" The key to how he could talk so long on this topic is the point of disagreement that he expected Mr. Cox to jump on, which was the marginal lands question. Mr. O'Toole has an interpretation of the marginal lands question and of the 1976 revisions of the Resources Planning Act and the 1979 regulations for implementing that act that are, as you might expect from the Regional Forester's presentation, different from the Forest Service's interpretation. It basically has to do with the treatment of standing volumes in determining economic suitability for management. I'll just clarify this point and leave it open for questions.

Section 19 of the regulations says, as Mr. O'Toole has pointed out, that lands economically unsuitable for forest land management should not be dedicated to timber management. It says that in making determinations of economic suitability, the stands currently on the land should be taken into consideration as well as any future stands.

In general (not on marginal land) if we were to assign a value of $12,500 per acre of standing volume of old growth, calculations similar to the ones Mr. O'Toole has made, we would probably give only about $1,000 for the bare land itself. So we have a large $12,500 value for standing trees and a factor of about a tenth, or $1,000, for all future stands of trees that would occur on that site.

This is where the contention comes in on the marginal lands issue. If we go down to less valuable stands of trees, let's say that we have a somewhat motley stand of $2,000 per acre that would cost $500 per acre to regenerate; Mr. O'Toole says that's something that shouldn't be done; other people say that you're $1,500 ahead if you harvest and regenerate those stands. So there's the issue of disagreement between Mr. Cox and Mr. O'Toole. I doubt if I see many others in terms of degree.

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* Transcribed comments.

I would like to bring to the attention of the audience three broad economic issues: what I would call the scarcity issue; the substitution issue; and the income-transfer issue. It might help to explain why this is a contentious issue.

The substitution issue relates to Mr. O'Toole's references to elasticity. The reason that there is any elasticity in demand for any substance is that there are substitutes for that substance. For instance, if we were to look at the demand function for air to breathe, there's no elasticity in that function, because there is no substitute for air to breathe. We might put some slope into that function when we start thinking of the quality of the air we breathe. But, certainly, if it was air of any sort to breathe, there's a certain amount we need. We don't respond by breathing less when the price goes up and breathing more as the price goes down. If we look at some provision of old growth preservation, there's no substitute for old growth attributes, historic attributes.

At some place down the vertical axis of Mr. O'Toole's graph he had a very high value for old growth preservation; farther out, with more old growth preserved, the value per unit declined. There are substitutes for public timber and substitutes for old growth timber. The substitute for old growth timber is young growth timber. The substitute for public timber is private timber. In the near term, the substitute for west coast old growth timber harvest is going to be Canadian imports, however. Something we should keep in mind is that the price impacts may not come on the national scene, but may come on the local and import-export scene.

The income-transfer issue is what I want to deal with. Why are people so hotly interested in this issue? It's because as wilderness advocates or outdoor advocates or as forests industry people, we're dealing with a question that involves real-income transfers.

A quick anecdote: Several years ago I was sitting in on a Forest Service panel that was dealing with the value of a wilderness day for RPA planning (the Forest Service is required to evaluate noncommodity resources as part of the RPA program) and a colleague of mine was giving a presentation on the value of a wilderness day. He came up with a quite generous per-unit-day value. It happened to be a year when I had undertaken a lot of wilderness activity, so when he finished I told him that over the previous year he had just enhanced my family income, at his value, by about $3,000 --expecting that some people wouldn't buy that (these were Washington people, probably Washington people who weren't that happy about being in Washington)--no contention about that came at all. Being within two hours driving distance of five wilderness areas didn't raise a hackle, in their case, as being worth $3,000. So, I came home to Oregon and told my story, thinking that Oregon people would react to that, and it didn't raise a hackle here; they said, "We'd probably pay you less by that amount to account for those sorts of things."

ECONOMIC ASPECTS: Response by Dr. Michael Haynes*

The basis of what I'd like to say, in summation of what I've been listening to all day, is found in the word "tanstafl," a term coined by Edwin Doland; it stands for "There ain't no such thing as a free lunch." I think we have to keep that in mind as we go through the types of exercises that we've done today.

There are a few concepts that I want to point out for you. We may very well value some of these things more preciously than you or I may realize. Professor Krutilla pointed it out best when he called it "option value"; that is, we may never see an old growth timber stand, but we may want the option for our children to see it.

I was impressed by the sociologist this morning talking about his mother riding the bus to go see an old growth stand. I wonder if my grandmother or my mother or my children will take the same Trailways bus to go see that stand. I'm concerned about it, and I want to be sure that it's there. That's the idea of option value.

It was pointed out that there was a lot of disagreement among economists, but I'd like to point out to you, "Where isn't there disagreement?" Do doctors disagree--have you ever been to a doctor for a second opinion? I trust, among themselves, they disagree more than anyone. Do attorneys agree about anything? I can think of nothing they agree about. Do foresters agree about anything? Some things, but not everything. We all have our own ideas about how we perceive the world.

Let me probe your thoughts, your minds, a little bit on how you perceive the world--just to show you the problem or the dilemma that we have here in talking about these types of issues. For example, when we have unemployment and high inflation in this nation at the same time, how many of you think inflation is the problem? Or is unemployment the problem? Which of the two is the problem? Or is it both? Which of the two is the more important problem? Whichever you pick, we have a dilemma, because I can't handle both at the same time, as an economist.

How many of you think the rich should be richer so they can trickle-down to the poor? The policy you perceive as the best one to handle this depends on how you perceive the world. That leads us quickly to how do you perceive old growth timber? Is it something that we need to save and have a lot of; or is it something that's there to be cut down because it's rotting and needs to be cut down quickly? I recognize that you all perceive this differently, whether you are an eco-freak, a timber beast, or a fed. You see, the problem becomes very apparent when we look at it in that way.

We talked here today about public goods--I know that Mr. O'Toole defined public goods, and I think we just had a reference to public goods again--let me emphasize that, one more time, because it's quite important. A public good is something two or more people can use simultaneously, and the consumption by one doesn't alter the consumption of another. You recognize immediately that we're talking about old growth timber, in that we could enjoy it together simultaneously. The problem, then, is to find a value for that, a willingness to pay to have that type of thing.

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* Transcribed comments.

If I started down the row and asked these people in the front row "How many of you are willing to pay to have old growth timber?" I'd get all kinds of strange answers. They would range from a few dollars to a few hundred dollars per unit, or whatever, of timber. By the time I got to the gentleman on the far right there, he would catch what's going on and say, "I won't pay anything for it." I'd ask "Why, isn't it of any value?" and he would say "No, they've already paid, and I'll get it anyway." And that's right, isn't it. That doesn't mean it's of no value; it means he just caught a public good.

Today, we've talked about how to arrive at a conclusion as to how much old growth we should have. I attended a seminar at the Winema National Forest in Klamath Falls. At that seminar there was a tree geneticist who said he envisioned the world as a group of trees, all straight and tall, as far as the eye could see--all straight, all perfect, all the same. That was his task, to grow trees like that. I remember we had talked about that at the seminar. The thought that came to my mind, and I hope comes to your mind, was "How many trees should there be?" You have to make a decision of how many: not that the world should all be a green tree, but how many there should be. As long as the per-unit cost of what we're doing is exceeded by the per-unit benefit of what we're doing, we should keep on doing it.

One of the slides Mr. O'Toole showed was a picture of a very green forest, a lush forest, with light filtering down through it. I believe that's the same picture that's on the wall of my office. There are some words below it, and I'd like to end with them: "Those things that we sometimes place little value in, may be priceless."

ECONOMIC ASPECTS:
Responses to Questions from the Audience*

Why have you chosen to ignore fish and water in your list of commodity values? What sort of commodity is the watershed? Do forest watershed resources constitute a commodity, and why or why not?

COX: I agree that some of these resources have commodity value. My impression was that other people would talk about fish and water, so consequently I did not include them.

A point I might make about watersheds or fisheries is that there is no conclusive evidence that old growth improves those values. My firm manages several watersheds which include a very intensive level of forest management, clearcutting etc. The water qualities are higher than need be in those watersheds. But I would agree that they have commodity value.

What are the economic benefits for the Forest Service in logging old growth forests that have a site productivity less than 50 cubic feet per acre per year?

COX: The economic benefits are not to the Forest Service. They would be to the people who would be working because of logging activities. The benefits are going to be logging jobs and other jobs which are created because of that basic manufacturing activity.

There are instances on private lands where companies are cutting trees and managing with less than 50 cubic feet per acre growth. They're not spending hundreds of dollars per acre to plant trees and thin and fertilize, but they are managing those lands.

On lands where you can't justify the carrying cost of planting trees after harvest, in other words you can't justify planting trees based on the value of future timber, why not just charge the reforestation cost as part of the cost of old growth?

O'TOOLE: I hear this question all the time, especially because the law requires planting of trees after you cut old growth. We really have to look at it a little differently. We have to ask "Why are we planting those trees?" It's not because we're cutting old growth. We're planting seedlings on land so that we'll have timber in the future. But if people aren't willing to pay the cost of growing that timber, why should we do it? The planting of trees must be attributed to the value of future timber, not timber today, or there's just no value in planting trees.

Industry expects to use their expected rate of return as their discount rate; it incorporates a margin for profit. But the Forest Service doesn't manage for

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* Transcribed comments.

profit, and it also incurs additional costs for resource protection during timber management, which the industry doesn't have to pay. Shouldn't Forest Service discount rates be lower than industry rates because of these additional costs and constraints?

O'TOOLE: My answer is no. The reason is very simple. If you look at what the Forest Service is managing, and don't worry about the costs and who is paying them, the Forest Service is spending a lot of money on low-site land intensively.

I can show you where the Forest Service is intensively managing low-site land and is spending lots of money doing it. I can show you industry lands that can produce four to five times what Forest Service low-site lands can produce, but they just sit there, because industry cut them off and didn't replant them, and now there are no trees growing there.

If we take the money the Forest Service is spending, for example, to convert old brush fields into timber production (old brush fields that are site IV and V) and spend it on private brush fields that are site III, we'll produce more timber at less cost. So the Forest Service must use the same discount rate as the industry or we're going to have inefficiency. We're going to be spending a lot of money, not getting much timber, and we're going to severely degrade the environment of the national forests when we don't need to do it because we can get more timber elsewhere.

HAYNES: The discount rate is very important. There are different views of the discount rate. The one most commonly held is that it is the opportunity cost of government borrowing. That is, if the government is going to borrow money from you by selling you bonds or securities, then that interest rate is the rate we should be using for the future because that's how you perceive the future. That's why you'll buy it at a certain interest rate.

That's how we typically look at the idea of discounting into the future. The discount rate can be modified quite a bit. You can do such things as include risks, include inflation, or include other factors in the discounting process. What it amounts to, in mathematical process, is nothing more than instead of using a discount rate of five, use a discount rate of five and a half, or six, or six and a half, or seven. The higher the discount rate, the lower the values. That's how you account for risks and inflation in the future, by using the discounting process.

I think Mr. O'Toole is quite correct in pointing out the importance of the discounting factor. It has a tremendous impact on decision processes. I've done some work with foresters, and they have a general feeling that four percent is quite low.

COX: I'll say a little about discounting. A discount rate of six or seven percent is not uncommon. At the same time, I can point out at least three detailed and highly credible studies that show managing most land in western Oregon is profitable at a ten percent discount. One key thing that Mr. O'Toole and I disagree about--and we do, surprisingly, agree on a lot of things--is the rotation age at which timber is harvested. That makes a big difference.

BRODIE: Just a short talk on the mystique of discounting: If we look at money market rates, they were above 14 percent last year. If we look at inflation, it went up and down, but it was about 10 percent. What we come up with is a real rate of return of about 4 percent. This is what an economist means by the real rate of return--the rate of return after you take the rate of inflation into account.

When you're talking about forestry investment, you're talking about a period of, let's say, 10 to 80 years. Very few other investment instruments have a maturity that long. A few series have been kept on long-term commercial paper, long-term bonds, the value of unimproved agricultural land. The historical rate of return of these kinds of instruments hasn't fluctuated very much. Over time, it has fluctuated between 2.5 percent and 3.5 percent. It lags the inflation rate. But for long periods of time that's all the fluctuation there is in the real rate of return. So people eventually see through the inflation veil and demand, when we have inflation for a long time, the upper end 2.5 to 3.5 percent range. Another generation goes by, and we may be able to fool a few more people a little bit more of the time.

Generally, for forestry investments I've used between 3 and 7 percent. I'd say 3 is low, 7 is high. It depends on the degree of risk that you perceive in forestry investment, relative, let's say, to high-grade commercial paper or relative to investment in something like agricultural land.

I can come up with values on the same unit of land of $600 or $1,800 or $3,000, depending on whether I assume the price of forest products will increase at the rate of 1 percent per year, 2 percent per year, or 3 percent per year. In retrospect, I'd say that nobody really knows how fast the prices of forest products are going to increase. The most informed opinion expects it to go up in the near term.

O'TOOLE: Let me start by making a couple of responses. First of all, we've talked about the discount rate; the rotation age has been mentioned. I don't want to get bogged down in these things. The discount rate is not that important; rotation age is not that important.

What is important is that the industry is actively spending money managing very high-site land. It's not actively spending money managing very low-site land, and it's not actively spending money managing a lot of middle-site land.

The Forest Service is actively spending money managing all the land. They aren't liquidating the old growth as fast as the industry would like. But they are spending a lot of money, and it just won't produce the return they want in terms of timber and jobs unless they start thinking about spending money only on the best land. If we do that, then we can leave all the rest of the land for old growth, wilderness, and all the other values.

There is a concern on some people's part about the assurance that, if the Forest Service increases timber harvests in the short run, that private lands would somehow respond as we think. And the questions is, how can we be assured of this?

COX: There is no guarantee, but I think timber harvests will be increasing in the future. Because of that, I think the Forest Service and the BLM, as the primary public agencies, are obviously going to have to exercise some prudence about how they increase timber harvests. There are several ways they can do this. The first would be under their existing even-flow policies--that is, their cut will go up and never come down. In that case, it wouldn't matter what happened on private lands, because the Forest Service would not increase its cut.

Another option is departures on federal lands, where the cut of older stands is accelerated for a short time and then the cut comes down. So there are two different ways that this can be achieved, and, obviously, the decision is going to be a weighty one.

If most mills can process second growth, why is there such intense pressure to liquidate old growth?

O'TOOLE: It's true that most mills can process second growth, but the Bueter report confirmed that there isn't going to be enough second growth to keep most mills alive. However, the Beuter report also said that we can maintain even flow in Oregon by cutting more old growth in the federal forests without having any downturns that will cause unemployment.

The problem is, there was nothing in the Bueter report or the subsequent forestry program for Oregon by the State Board of Forestry to guarantee that that would work. What the Bueter report said was that the Forest Service has to increase its harvest by 30 percent and at the same time the industry has to decrease its harvest by 30 percent.

But Weyerhaeuser doesn't buy from the Forest Service; it has its own land. Weyerhaeuser isn't going to decrease its harvest by 30 percent just because the Forest Service increases its harvest by 30 percent. The Bueter report says that companies like Weyerhaeuser can continue their harvests at current levels for at least 50 years. If it doesn't decrease its harvest, then we'll have a falldown in the future twice as big as the one we're talking about today.

So, I said maybe we can have departures on federal lands, but only if they are tied to some kind of controls on private land--which most private land owners would find unacceptable--to make sure harvests are coordinated.

Your economic analysis depends on considering the economic values to people of various land uses. It seems there is no way to include plants and nonhuman animals as interested parties in economic analyses. Do economists speaking today see any way of including the

survival interest of plants and nonhuman animals in their analyses?

O'TOOLE: No, they don't count. Let me tell you why they don't count. Some plants and nonhuman animals have a zero value to humans. Some plants and nonhuman animals have a negative value. One living organism that I can think of that has a negative value is smallpox. How many people here are willing to volunteer for a program that will ensure the survival of smallpox? That's why economists don't put any value on the things that humans don't value.

SUMMARIZATION

Speaker: Dr. Charles Duncan, Professor Emeritus, School of Journalism, University of Oregon, Eugene

SUMMARIZATION*

Dr. Charles Duncan

I suspect that I was invited to fill this role largely, if not solely, on the basis of an article that I wrote for the Eugene Register Guard (July 23, 1981) about the spotted owl. It was written more or less as a tongue-in-cheek article. But by the time the aftermath and all were over, I decided it was a mouth-full-of-feathers article.

> The northern spotted owl is in trouble.
>
> Already listed as a threatened species in Oregon, this large (16 to 19 inches high) brown and white spotted bird of the night (Strix occidentalis) is the center of a growing controversy in Washington (the state, that is, not the city -- yet), where to date it has not been so designated.
>
> It is the spotted owl's bad luck to be so designed as to be able to live only in old-growth forest land. Worse, he needs lots of it. According to the U.S. Fish and Wildlife Service, as reported by UPI recently, each pair of spotted owls requires about 1,000 acres of old-growth timber just to keep body and soul together. Flying squirrels, wood rats, bats and other birds are the chief food items (no field mice?), and the per-acre yield of such fare is presumably fairly low.
>
> What's more, S. occidentalis is said to be temperature-sensitive (whoo isn't?) and must have the protection of dense, old-growth tree canopies.
>
> In short, your spotted owl needs space, and he wants it cool, man.
>
> That kind of lifestyle is expensive to maintain. Therein lies the controversy. Two agencies of the federal government see things differently -- so what's new? -- as do various state agencies and private interests.
>
> The Wildlife Service wants the Forest Service to set aside old-growth timber in Washington for the owl. Demurring, a Forest Service spokesman alleges that the timber required to maintain just one pair could sell for anywhere between $1.5 million and $18 million. Nobody is going to pin that guy down to a firm figure.
>
> It is unknown for sure (a) how many spotted owls there are now on the West Coast or (b) how many would be needed to sustain "a viable population," whatever that might mean, but the round number of 500 pairs, distributed from California to British Columbia, is given as the best guess.

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* Transcribed speech.

Multiplying owls by acres (500 x 1,000 -- my kind of math!) we get 500,000 acres of old-growth timber needed. That figures to 781 square miles, which is somewhat more than half the size of Rhode Island, a state which in turn is less than one-fourth the size of Lane County. With the three Pacific Coast states plus British Columbia having a combined land area of 678,394 square miles, a mere 781 doesn't seem too much to ask for these nice birds. Unfortunately, not all of that vast land area is in old-growth timber. Ay, there's the rub.

Turning to cost, we now multiply owls by dollars. Taking the cautious Forest Service man at his word, the value of the timber in the spotted owls hypothetical "viable population" habitat comes to somewhere between $750 million and $9 billion. Hoot mon!

Opinion on the issue runs the predictable gamut from timber industry representatives who state that the spotted owl is in "absolutely no danger" of being "threatened or endangered" to "the preservationists" (the other side's term) who insist that it most certainly is.

"How many owls can we afford to protect?" asks John B. Crowell, Jr., assistant U.S. secretary of agriculture for natural resources and environment (Mr. Crowell is another of President Reagan's fox-in-the-henhouse appointments in the opposition's book). "Can we afford not to have the spotted owl?" counters Lora Lescher, a Washington State Game Department biologist.

Still another view is that the spotted owl isn't really the issue at all; rather it is the larger question of clear-cutting old-growth timber.

"It's unfair to hang the fate of old-growth forests around the spotted owl's neck," says one partisan, thus casting the hapless bird in a role somewhere between that of a red herring and the Ancient Mariner's albatross.

Meanwhile, nobody seems to be giving any thought to all those flying squirrels, wood rats, bats and other birds -- and surely field mice too -- the spotted owl eats. Incalculable is the number of them also facing a bleak future. True, the prospect of being swallowed by a spotted owl, however nice otherwise, is not what could be called a bright future, but it may be better than the alternative, namely, curtains for all, including those that got away.

Supposing a spotted owl in good health consumes one field mouse per day -- probably a conservative estimate, though not from a mouse's point of view -- and dines once a week on a flying squirrel, wood rat, bat or another bird, our 500 pairs, gliding on silent wings through the gloom of old-growth forest in various parts of California, Oregon, Washington and British Columbia,

> would ingest 365,000 field mice a year (366,000 every Leap Year) and 52,000 flying squirrels, wood rats, bats and other birds in any combination. That is a lot of fauna.
>
> How will it end? Ask any passenger pigeon, ivory-billed woodpecker or snail darter.

So, I came here expecting to learn, first of all, the nature of the problem revolving around old growth. But I really didn't know what it was. I also wanted to know, of course, something about the dimension of the problem. How much old growth is there? I find today that nobody knows for sure, and that's really not surprising. But I also find that there is really quite a lot, which is to me somewhat reassuring, but not entirely so, because it wasn't too long ago that we had lots more of things that we don't have too much of now. We have to keep that in mind.

What I'm going to do is read for you 14 or 15 observations, questions and comments that seem to me to be worthy of more consideration, perhaps. Let's say they're the ones that interested me. They're the ones that I heard that seem to me not necessarily the most important, but among the most important things. I'm sure I've missed a lot of them that to others might seem equally as important, if not more so.

The first thing that impressed me, in order of appearance, is the lack of information in the face of so much information. I heard so much today, yet everybody says there's so much that isn't known. That to me is a rather astonishing condition of this particular issue.

Second, old growth, if I heard someone correctly, is less than two percent of the presently available timber. I presume that's in Oregon, but I don't know for sure. Yet, it in itself is a multimillion-dollar industry and issue of that dimension.

A third point, and this is in the form of a question, I found myself wondering if the discussion today, broad and multi-faceted as it was, wasn't perhaps just a little too provincial. I heard nothing about this or comparable issues or questions in other parts of this country (the South, the East), Canada or, particularly, in other parts of the world. Is this a problem, or something like it a problem, in countries where forests have been a part of the economic and cultural and social and spiritual scene for generations and even for centuries?

Nothing was said about the Black Forest, about Sweden, Finland, the Amazon, New Zealand, and so on. I realize there wouldn't be time to get all that in, but it might have been well to have something in there to give a little more perspective, a little more background.

Another point, I was impressed more than once by the emphasis on the need for research. And yet there seems to be a strong basis for supposing that the needed funds are being cut and probably will be cut even more in the future. So what conclusion can be drawn from those two opposing facts -- if the latter is a fact other than a rather pessimistic conclusion?

Five, what is at stake here, really? What are the dimensions of the economic aspect, board feet, the jobs, the relative importance of the dollars to the total industry, and so on? Now this was written down in my notes before the afternoon session, and the economic and commodity aspect of this was addressed later on.

Sixth in my notes is a comment someone made or a question that arose in my mind from a comment, "Is it better to have numerous small-scale accessible old growth stands instead of large stands in remote areas?" Well, it's interesting that the answer to that, as the answer to so many things, is yes and no and, also, it depends. I don't say this with irony or sarcasm at all. It's a fact that we have to live with. There is no simple answer to that. A good case can be made for both.

Seven, what are implications for old growth of the present administration policies toward the environment, natural resources, and so on. I don't propose to cast that in any negative or positive political framework. I simply say it's a question that is valid.

Mr. Sirmon referred to the administration view of old growth as a source of revenue. We know that this administration is very keenly interested in revenue sources. Guess I'd better stop on that topic.

Eight, related to the above question, Mr. Sirmon again spoke of a five-year research program. This does relate to an earlier point. The question, of course, is "Is this five-year program adequately funded?" The question was raised at the luncheon. Mr. Sirmon responded in the affirmative, at least in his view that it is adequately funded, and I certainly hope, and I'm sure you agree, that that is true.

Ninth, the commodity value of old growth seems to be one of the cruxes of the issue, if not the crux. David Cox put some facts and figures on this. This is an issue that cannot be ignored and simply will not be ignored.

Mr. O'Toole says that land unsuitable for sustained-yield timber management should be withdrawn according to law. Then he expanded on this topic at some length. It seems to me that this is a fundamental fact that has to be looked at again and again and driven to the ground.

If I'm not mistaken, he said that the Forest Service discount rate is about four percent as compared to a private industry discount rate of five to ten percent. Although I couldn't follow his reasoning, I do accept his conclusion that that is a bad thing.

Eleven, the economic aspects which were dealt with by both Cox and O'Toole and the panelists are, I suppose, the most important aspects of the whole question.

Twelve is a hesitantly offered appraisal of this conference, or a prediction perhaps. I'm bold to say this may turn out to be a landmark event in the old growth issue. Perhaps I should say a watershed event. It does seem that to my knowledge there hasn't been one like this before, at least not here, and I think you may have started something.

If there are to be more of these conferences -- and I hope so, although not necessarily in the same format -- it may be well if I offer a gratuitous suggestion: it may be well to provide for true discussion and debate among the audience.

Thirteen, one speaker, Mr. Cox, said that at the bottom line, to use a bad phrase, the decisions will be political in this issue. I would accept that with the added qualification or understanding that, as I see it, most political decisions are based on economic factors. I think this one is no exception.

Next to last, I'm left with an overwhelming astonishment -- bordering on awe -- at the complexity of the old growth subject, especially in view of the astonishing disclosure that as recently as ten years ago biologists -- I wouldn't say all of them, certainly, but I take it many of them -- regarded old growth forests as "biological deserts." If the picture has been altered that much, if learning has been advanced that much in a decade, what will the subject of old growth look like ten years from now?

And, in conclusion, fifteen, it's conferences like this that can help vastly to reach the most satisfactory answers possible.

NORTHWEST FORESTRY: A VIEW FROM WASHINGTON

Remarks prepared for delivery by John B. Crowell, Jr., Assistant Secretary of Agriculture for Natural Resources and Environment, at the Western Forestry Center, Portland, Oregon, January 19, 1982. (A videotape of Mr. Crowell's Portland speech was played at the end of the Old Growth Conference. Following are excerpts from the speech which deal with old growth policy and mangement.)

EXCERPTS FROM "NORTHWEST FORESTRY: A VIEW FROM WASHINGTON"

John B. Crowell, Jr.

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The renewed interest by the forest products industry in the South as a producing region was occurring simultaneously with declines in harvest rates in the Pacific Northwest. The cause of this decline was the fact that privately and industrially owned lands were being harvested at more rapid rates than could be sustained indefinitely from the private lands alone.

This phenomenon has been glibly characterized by many as "overcutting"--a term which, though accurate in one sense, has served to obscure, oversimplify, and to imply opprobrium of what was both a rational and altogether necessary process for bringing these lands, which were heavily stocked with old growth timber far in excess of needed growing stock inventory, under good forest management for the benefit of future generations.

Despite the decline in harvest rates in the Douglas-fir region over the last 20 years, and despite the large volumes of timber well past maturity on the National Forests of northern California, western Oregon, and western Washington, the Forest Service gave no sign that it intended to increase its harvest rates. In fact, all signals until a year ago were to the contrary.

Could Markedly Accelerate Harvests

The plain and simple fact is that we can markedly accelerate harvests in the National Forests which have large inventories of old growth softwood sawtimber. We're already losing unacceptably large volumes to mortality and disease. After harvest of the old growth, we can increase timber growth on those forests. Their current net annual timber growth is well below the biological and economic potential. By regenerating nonstocked areas, by harvesting and regenerating mature stands, and by applying intensive management measures such as spacing control and use of genetically improved trees, we can greatly increase current growth and can offer the prospect of continued high harvest levels for the indefinite future.

With the very clear potential for greatly enhanced production from the forests of the Northwest, including the National Forests, it is obvious that the future of the forests products industry in the Pacific Northwest is extremely bright. But a big job must be done on the forest lands of the Northwest and, because so much of that land is under Forest Service stewardship, much of the job must be done there. I intend to see that it gets well started.

Let me refer briefly to the Forest Productivity Report, published by the Forest Industries Council in 1980. The objective of the study was to analyze and make recommendations for improving forest productivity in the U.S. on a state-by-state basis. The report showed that changed management of federal forest lands could nullify the timber shortfall otherwise facing the Douglas-fir region.

Opportunities in Western Washington and Oregon

The Forest Productivity Report determined various forest management treatments that could result in at least a 10 percent post tax incremental return on investment, taking into account variances in ownership objectives and their effects on stand rotation periods. For western Oregon and Washington, almost 12 million acres were determined to have the potential for at least this 10 percent post tax return, resulting in additional wood growth of more than 2 billion cubic feet annually. This increase would represent an eventual doubling of present annual growth. The highest potential for increased growth, of course, was on federal lands. Net growth on the National Forests could be nearly quadrupled.

Treatments Needed

The report recommended treatments needed to reach more of this potential. The major opportunity to increase productivity is increased harvest of old growth timber, followed by rapid regeneration through planting or aerial seeding, and subsequent intensive management. In western Oregon, harvest of old growth timber and rapid regeneration accounts for 72 percent of the additional growth opportunity. In western Washington, this treatment would generate 49 percent of the projected additional growth. The largest portion of old growth timber, about 4.2 million acres, is within National Forests.

On privately-owned lands, the greatest opportunity for increasing productivity is through site rehabilitation and hardwood conversion. However, the cost of the initial investments is high, because of the necessity of clearing the land for planting. The best opportunity for short-run growth increases and economic returns on these lands is through precommercial and commercial thinning and application of fertilizer. The resulting incremental yields, however, are considerably less than those possible through the other treatments.

Opportunities in Eastern Washington and Oregon

While the forests of eastern Washington and eastern Oregon are considerably less productive than the Douglas-fir country to the west, they still are important contributors to the region's forest resource base. However, growth improvement possibilities are somewhat limited because of high initial investment costs. Aproximately 5.7 million acres were determined to have the potential for at least a 10 percent post tax incremental return, resulting in additional wood growth of 375 million cubic feet a year. The best opportunity to increase productivity on these lands is, once again, harvests of old growth timber. However, unlike the western slope forests, natural regeneration after harvest actually rivals, and in some cases is favored over, planting or seeding. Again, this opportunity is predominant on National Forest lands.

In contrast, the potential for production of wood in the South was shown by the Forest Productivity Report to be far below that of the Pacific Northwest. If we can overcome some of the restraints to using this vast potential, then there is no need for any forest products company to close its doors in the Pacific Northwest because it cannot obtain raw material at a fair price.

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National Forest Old Growth

Another barrier to more efficient National Forest management has been the timber policy of "non-declining even flow." In essence, this policy prohibits any planned reduction in timber harvest on any National Forest; it requires current harvest to be set equal to or below what a forest could produce under a given level of management when it is in a "fully managed" condition, even though that condition may not be reached for many decades. A fully managed forest is one in which there is a mosaic of stands of various ages, ranging from recently harvested to mature forest stands. Stands are harvested as they mature and are promptly replanted; in this way there is a continuous process of harvesting and a relatively even amount of timber available from decade to decade in perpetuity

But no western National Forest is currently in a fully-managed condition. Instead, because no harvesting had taken place there until a few decades ago, the western National Forests have accumulated huge volumes of trees long past the age at which they would be harvested in a fully managed forest. The volume of wood present in these old growth forests far exceeds what would be present as growing stock inventory once the forest is in a fully managed condition.

Could Temporarily Accelerate Harvest

Although the non-declining flow policy may have merit when applied to a fully managed forest, the policy makes no sense when applied to an old growth forest. The so-called old growth timber, which has matured and has virtually stopped growing, makes up three-fifths of the National Forest timber in the Pacific Northwest. It offers the greatest immediate potential for increasing timber harvesting from the National Forests--often with very reasonable costs--so that returns to the treasury are likely to be high. The Forest Service's figures show that timber harvest in these old forests can be temporarily accelerated to take advantage of this "surplus" volume, without jeopardizing future harvest levels.

There are two primary causes for this: One is that accelerated old growth harvesting allows society to capture timber volume that otherwise would be lost to mortality and decay. Most old growth forests are growing very slowly and are subject to heavy losses from natural causes. The second is that old, slow-growing stands are replaced by stands that have a much faster rate of growth. Replacing these old stands with vigorous new ones enables us to utilize a rapidly deteriorating resource and to provide space for young fast-growing stands.

Rigid application of the non-declining flow policy to old growth forests condemns to fire, mortality, and decay all of the accumulated volume in excess of needed growing stock inventory. Such an application, of course, is inappropriate and is in the process of being changed as the National Forest Management Act of 1976 permits.

Old Growth and Habitat Diversity

In spite of the need to accelerate the harvest of old growth timber, we also need to recognize the value of old growth as an element of habitat diversity and as habitat for certain wildlife species. I realize that a major reason for the concern with old growth is for those wildlife species which appear to require old growth conditions.

I intend that, on those National Forests which have old growth, the forest plan will provide for managing old growth component. Old growth stands are subject to change over time. This means that if we are to be certain of an old growth component in the future, we must provide for it today. This does not mean that all current old growth stands will be maintained; neither does it mean that all will be cut. It means that management of old growth, to the maximum extent possible, will be integrated with other aspects of the management plan. We intend to acquire the necessary information on the role that old growth plays in the habitat requirements of these species, and we will also explore ways to manage younger stands to provide these requirements. . . .

Old Growth Forests

A Balanced Perspective

February 12-14, 1982

VALLEY RIVER INN
Eugene, Oregon

CONFERENCE PROGRAM AND CONFERENCE REGISTRANTS

PROGRAM

FRIDAY, FEBRUARY 12

Valley River Inn Lobby

7:00 p.m. Registration

Rogue River Room

7:00 Reception and Exhibits on Current Research

Umpqua Room

7:30 "Natural Timber Country"
A film by Ron Finne

8:45 "Forest Spirit--A Work in Progress"
A multi-image slide presentation by
Travelling Image Company, Portland

SATURDAY, FEBRUARY 13

Lobby

8:00 a.m. Registration

McKenzie Room

8:30 Opening Remarks: Laurie Power,
League of Women Voters

8:45 Ecological Aspects: Dr. Jerry Franklin

Response Panel:

Dr. O. C. Wallmo, Retired Wildlife Biologist
Dr. Robert Vincent, Wildlife Consultant
Dr. Jack Ward Thomas, Chief Research Wildlife Biologist, Pacific Northwest Forest and Range Experiment Station
Dr. E. Charles Meslow, Associate Professor, Oregon Cooperative Wildlife Research Unit Oregon State University

Moderator: Mary Sherriffs,
League of Women Voters

10:15 Coffee Break

PROGRAM

10:30 Sociological Aspects: Dr. Richard Gale

Response Panel:

Dr. Perry Brown, Head, Resource Recreation Management, Oregon State University
Mr. Iain Robertson, Associate, Jones & Jones Architects and Landscape Architects
Dr. Carl Hosticka, Assistant Professor, CSPA, University of Oregon
Dr. Earl Pomeroy, Professor of History, University of California, San Diego

Moderator: Annabel Kitzhaber,
League of Women Voters

Willamette Room

12:15 p.m. Luncheon Address: Mr. Jeff Sirmon

McKenzie Room

2:00 Economic Aspects: Mr. David Cox
Mr. Randal O'Toole

Response Panel:

Dr. J. Douglas Brodie, Associate Professsor, Forest Management, Oregon State University
Dr. Michael Haynes, Associate Professor, Economics, Southern Oregon State College

Moderator: Sharon Posner,
League of Women Voters

4:00 Summarization: Dr. Charles Duncan, Professor Emeritus, School of Journalism, University of Oregon

SUNDAY, FEBRUARY 14

8:30 a.m. Field Trip #1 to old growth stand

9:00 a.m. Field Trip #2 to old growth stand

SPEAKERS

Ecological Aspects

Jerry Franklin is chief plant ecologist with the Pacific Northwest Forest and Range Experiment Station, U.S. Forest Service, Corvallis. He is also a professor of botany and forest sciences at Oregon State University. His areas of expertise include botany, plant ecology, silviculture, and forest ecosystems.

Sociological Aspects

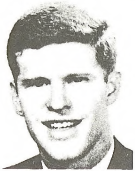
Richard P. Gale is associate professor of sociology at the University of Oregon. He has served as sociologist and consultant to the U.S. Forest Service and the Pacific Northwest Forest and Range Experiment Station in Seattle. Many of his studies deal with the environment and environmental groups.

Management Aspects

Jeff M. Sirmon recently became the regional forester for the Pacific Northwest (Region VI) of the U.S. Forest Service. He has had various positions with the U.S. Forest Service, including regional forester for the Intermountain Region. He has a civil engineering background.

SPEAKERS

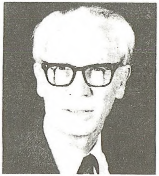
Economic Aspects



David Cox is a forest economist with Mason, Bruce & Girard, Inc., Portland. His work involves forest management, economic and environmental analysis and long-range planning. He is chairman-elect of the Society of American Foresters' committee on economics, policy and law.

Randal O'Toole is the director and forest economist of Cascade Holistic Economic Consultants in Eugene and is the publisher of Forest Planning. His publications include research in timber productivity and land suitability as well as citizen educational guides.

Summarization



Charles T. Duncan is professor emeritus of journalism at the University of Oregon. At the university he not only taught but also served as dean of the journalism school and as dean of the faculty.

OLD GROWTH FOREST CONFERENCE
February 13, 1982

Registrants

Name	Affiliation	City
Agpaoa, Elizabeth	U.S. Forest Service	Eugene
Alaback, Judy	Student, Oregon State University	Philomath
Anderson, Chuck	U.S. Forest Service	Eugene
Anderson, Dorothy	League of Women Voters	Eugene
Anderson, Mike	Student, University of Oregon	Eugene
Anker, Edrey	Audubon Society	Eugene
Arvidson, Gene	Student, University of Oregon	Eugene
Atkins, Dave	U.S. Forest Service	Eugene
Atwood, Shirley	Student, Lane Community College	Eugene
Babcock, Norman	UO Survival Center	Eugene
Baker, Ed	none listed	Eugene
Baker, James	OWC McKenzie Guardians	Finn Rock
Baker, Judith	OWC McKenzie Guardians	Finn Rock
Barnes, Esther	none listed	Eugene
Barnes, John	Bureau of Land Management	Eugene
Barstad, Bob	U.S. Forest Service	Eugene
Bauman, Tom	American Alpine Club	Springfield
Becker, Mark	Bull Run Open Newsletter	Gresham
Behm, Fred	none listed	Blue River
Behm, Mrs. Fred	none listed	Blue River
Belcher, Jon	Lane County Audubon Society	Eugene
Benneth, John	American Forestry Institute	Tigard
Bernholdt, Marianna	Native Plant Society	Salem
Beroz, Neal	none listed	Troutdale
Bielefeldt, Doug	Student, Oregon State University	Corvallis
Bielefeldt, Talbot	Willamette Valley Observer	Eugene
Bloomberg, Richard	Sierra Club - Many Rivers	Eugene
Blott, Daniel	none listed	Oakridge
Boehm, Ron	U.S. Forest Service	Eugene
Braasch, Gary	none listed	Portland
Brady, Rex	U.S. Forest Service	Eugene
Brenner, Barbara	none listed	Eugene
Brodie, Ann	none listed	Corvallis
Brooks, Sydney	Student, Lane Community College	Eugene
Brown, Richard	History Department, UO	Eugene
Brown, Rick	none listed	Portland
Bruce, Charles	Oregon Department of Fish & Wildlife	Corvallis
Burns, James	U.S. Forest Service	Prospect
Burwell, Dave	Forest Consultant	Leaburg
Burwell, Gale	U.S. Forest Service	Eugene
Cady, Gayla	Siuslaw Task Force	Corvallis
Campion, Tom	Seattle Audubon Society	Seattle, WA

Registrants continued

Name	Affiliation	City
Carlson, Dan	Oregon Department of Fish & Wildlife	Portland
Carlson, Eric	none listed	Corvallis
Carlson, Melissa	U.S. Forest Service	Eugene
Caswell, Jim	U.S. Forest Service	Eugene
Christensen, Kurt	none listed	Reedsport
Christner, Jere	U.S. Forest Service	Eugene
Clark, Stacey	U.S. Forest Service	Eugene
Clark, Terence	U.S. Forest Service	Eugene
Cline, Steve	Student, Oregon State University	Corvallis
Connelly, Bill	none listed	Roseburg
Cook, Stanton	Biology Department, University of Oregon	Eugene
Cortese, Mary	Student, University of Oregon	Eugene
Crawford, Jack	Crawford Logging Company	Walterville
Cromack, Kermit	Forest Science Department, OSU	Corvallis
Crowell, John	none listed	Eugene
Crowley, Vickie	none listed	Eugene
Culbertson, Alice	Student, Oakridge High School	Oakridge
Culbertson, Dick	U.S. Forest Service	Oakridge
Curtis, Alan	Bureau of Land Management	Eugene
Dafoe, Vera	none listed	Portland
Dawson, Fred	Bureau of Land Management	Eugene
DeLapp, Jim	U.S. Forest Service	Cottage Grove
Desmond, Jack	Sierra Club	Eugene
Dewitz, John	U.S. Forest Service	Eugene
Diaz, Leonard	U.S. Forest Service	Eugene
Dillon, Tom	U.S. Forest Service	Eugene
Dodge, Nick	American Alpine Club	Portland
Doebel, John	U.S. Forest Service	Olympia, WA
Dugas, Bill	U.S. Forest Service	Eugene
Dunham, M. C.	Martin Harmsen Memorial Wildlife Sanctuary	Blodgett
Durning, Jean	The Wilderness Society	Seattle, WA
Eggenbecker, Ueli	U.S. Forest Service	Eugene
Elkus, Ben	Hoedads, Inc.	Eugene
Engbretson, Peter	Office of Park Commissioner	Portland
Evenden, Fred	Natural Resources Consultant	Eugene
Everett, Jim	Forest Industries Management Center	Eugene
Farling, Bruce	none listed	Eugene
Foisy, Robert	none listed	Coos Bay
Fontaine, Barbara	Student	Arcata, CA
Ford, Phyllis	Recreation & Park Management Dept., UO	Eugene
Frazier, J. Michael	U.S. Forest Service	Mapleton
Frenkel, Elizabeth	Sierra Club	Corvallis
Frenzen, Peter	Student, Oregon State University	Corvallis
Frisch, Conny	U.S. Forest Service	Eugene

Registrants continued

Name	Affiliation	City
Gallegly, Michael	U.S. Forest Service	Eugene
Gardner, Dave	U.S. Forest Service	Eugene
Gehrman, Robert	Forestry Contractor	Springfield
Glaspy, Danny	U.S. Forest Service	Eugene
Golde, Marcy	Washington Environmental Council	Seattle, WA
Gonzales, Jessica	U.S. Forest Service	Ideleyld Park
Gordon, Joan	N.W. Forestry Workers Association	Eugene
Grace, Dick	U.S. Forest Service	Eugene
Graney, Michael	OWC McKenzie Guardians	Finn Rock
Gray, Don	U.S. Forest Service	Eugene
Gredler, Gail	Hardesty Mountain Study Group	Eugene
Grimes, Christopher	none listed	Eugene
Gruber, Gerald	none listed	Eugene
Harrington, Robin	none listed	Eugene
Harris, Gary	U.S. Forest Service	Eugene
Harshman, Ed	U.S. Forest Service	Eugene
Hassler, Allison	U.S. Forest Service	Eugene
Haubrich, Chris	Bureau of Land Management	Eugene
Hausam, David	none listed	Eugene
Heckel, W. D.	Gifford Pinchot National Forest	Carson, WA
Henderson, Bruce	Sierra Club	Portland
Henderson, Diane	Student	Lowell
Hendricks, Robert	U.S. Forest Service	Portland
Herbert, Edward	Audubon Society	Eugene
Hermach, George	Sierra Club	Eugene
Hershey, Robert	Bureau of Land Management	Salem
Hicks, David	U.S. Forest Service	Eugene
Ho, Leighton	Student, University of Oregon	Eugene
Hopps, Blair	Student, Willamette University	Salem
Hosek, Linda	Statesman-Journal	Salem
Hostetter, Robert	Bureau of Land Management	Portland
Howe, Kent	Lane County Planning	Eugene
Howells, Dan	Bureau of Land Management	Springfield
Hubbard, Jim	Timber Products	Springfield
Hughes, Jeffrey	Student	Eugene
Hussey, Tom	U.S. Forest Service	Eugene
Hutchins, Jerry	U.S. Forest Service	Corvallis
Immerman, Marty	Regional Coordinator	Eugene
Ingram, Paul	Oregon Department of Fish and Wildlife	Corvallis
Irving, Roy	Redwood National Forest	Arcata, CA
Jackson, Ron	U.S. Forest Service	Estacada
Jacobs, Elizabeth	Save Our Eco-Systems	Eugene
Jensen, Gary	Lane Plywood, Inc.	Eugene
Johansen, Claire	Student, Oregon State University	Corvallis
Johansen, Kim	none listed	Corvallis
Johnson, Don	BGRS, University of Oregon	Eugene

Registrants continued

Name	Affiliation	City
Johnson, Gerald	Bureau of Land Management	Eugene
Johnson, Jean	League of Women Voters	Eugene
Johnson, Kathy	U.S. Forest Service	Eugene
Johnson, Rod	U.S. Forest Service	Walla Walla, WA
Jones, Doreen	Sierra Club - Many Rivers	Eugene
Jones, Mikeal	none listed	Roseburg
Jordan, Kathleen	U.S. Forest Service	Eugene
Kain, Margaret	U.S. Forest Service	Eugene
Kaminski, Michael	Bureau of Land Management	Eugene
Kaupa, John	U.S. Forest Service	Roseburg
Keenan, Druscilla	none listed	Seattle, WA
Kelley, Barbara	Save Our Eco-Systems	Eugene
Kerrick, Michael	U.S. Forest Service	Eugene
Kitzhaber, Annabel	League of Women Voters	Eugene
Kleckner, Wayne	U.S. Forest Service	Cottage Grove
Klein, Glenn	Student, University of Oregon	Eugene
Koeltzow, David	Bureau of Land Management	Eugene
Kollmeyer, Jane.	none listed	Blue River
Kraft, K. C.	Obsidians	Eugene
Kramer, Steve	UO Survival Center	Eugene
Krisor, Patricia	Student, Mt. Hood Community College	Portland
LaCava Jerry	U.S Forest Service	Eugene
Larson-Fertig, Bonny	none listed	Stayton
Levin, Judith	U.S. Forest Service	Gresham
Lewis, Alice	League of Women Voters	Eugene
Lewis, Graydon	none listed	Eugene
Lindner, Jack	U.S. Forest Service	Medford
Lindsell, Dave	U.S. Forest Service	Eugene
Lindsey, Ken	U.S. Forest Service	Eugene
Logan, Sheila	U.S. Forest Service	Eugene
Logan, Wayne	Bureau of Land Management	Salem
Lopez, Tony	U.S. Forest Service	Eugene
Lorenz, Charles	Ecosystems, Inc.	Lacey, WA
Loy, Esther	League of Women Voters	Eugene
Lucier, Charles	none listed	Eugene
Luman, Ira	Bureau of Land Management	Portland
Madden, Ellen	League of Women Voters	Eugene
Mahlein, Dieter	Oregon Wilderness Coalition	Cottage Grove
Mahlein, Kim	Oregon Wilderness Coalition	Cottage Grove
Mannan, R. William	Student, Oregon State University	Corvallis
Martin, Dennis	U.S. Forest Service	Eugene
Martin, Mark	Student, University of Oregon	Eugene
Mansfield, Nonie	League of Women Voters	Eugene
Mayo, Jim	U.S. Forest Service	Eugene
McDonald, Glenn	U.S. Forest Service	Troutdale
McDonald, Julie	Sierra Club	San Francisco, CA

Registrants continued

Name	Affiliation	City
McLaughlin, William	Bureau of Land Management	Eugene
McVay, Vanessa	Student	Oakridge
Meacham, Marian	Washington Environmental Council	Port Ludlow, WA
Meckley, Don	Bureau of Land Management	Eugene
Metzger, Bob	Bureau of Land Management	Portland
Meyers, Mike	none listed	Eugene
Meyrowitz, Ed	Natural Earth Foundation	Eugene
Michaels, Norm	U.S. Forest Service	Eugene
Mickel, Tom	Audubon Society	Eugene
Millan, Howard	SAF	Tacoma, WA
Miller, Fred	N.W. Coalition for Alternatives to Pesticides (NCAP)	Eugene
Monje, Kathleen	The Oregonian	Pleasant Hill
Monteith, James	Oregon Wilderness Coalition	Eugene
Montgomery, Monte	Association of Oregon Loggers	Eugene
Moravcsik, Fran	Landscape Architect	Eugene
Morse, Eric	U.S. Forest Service	Eugene
Murdock, Dave	U.S. Forest Service	Eugene
Neitro, William	Bureau of Land Management	Aloha
Newton, Betty	none listed	Portland
Newton, Frank	Oregon Department of Fish & Wildlife	Portland
Nichols, Doland	Student, Lane Community College	Eugene
Nichols, Teresa	U.S. Forest Service	Eugene
Norlin, Dick	Bureau of Land Management	Roseburg
Novak, Mark	U.S. Forest Service	Eugene
Noyes, Richard	Sierra Club	Eugene
O'Brien, Mary	Student, Clairmont University	Eugene
Olsen, David	Siuslaw National Forest	Corvallis
Orum, R. Marriner	none listed	Eugene
Otte, Rose	League of Women Voters	Ashland
Parker, Linda	U.S. Forest Service	Eugene
Patterson, Pat	U.S. Forest Service	Eugene
Patterson, Steve	U.S. Forest Service	Eugene
Patton, Dwight	Bureau of Land Management	Eugene
Pavlat, Warren	U.S. Forest Service	Eugene
Perkins, Bob	none listed	Seattle, WA
Perkins, John	Student, Lane Community College	Eugene
Perkins, Kathi	none listed	Seattle, WA
Peterson, Al	U.S. Forest Service	Eugene
Peterson, Nancy	Oregon Wilderness Coalition	Portland
Phipps, John	U.S. Forest Service	Eugene
Pitt, Lewis	none listed	Warm Springs
Polenick, Sara	Defenders of Wildlife	Medford
Powell, John	Natural History Society	Eugene
Pratt, Camilla	League of Women Voters	Eugene

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Registrants continued

Name	Affiliation	City
Priestley, Joanna	Travelling Image Co.	Portland
Prior, John	none listed	Eugene
Raphael, Martin	University of California, Berkeley	Willow Creek, CA
Raymen, Steve	N.W. Cultural Films	Eugene
Rettig, Penn	Student, University of Oregon	Eugene
Rheinberger, Steve	U.S. Forest Service	Eugene
Rice, Deborah	none listed	Eugene
Ritchey, Michael	Cascade Handle Co.	Eugene
Rittersbacher, Dave	U.S. Forest Service	Eugene
Roach, Marcia	Student, University of Oregon	Eugene
Rodin, Jane	Lane County Audubon Society	Eugene
Rose, Lee	Student, Mt. Hood Community College	Estacada
Ross, Ben	none listed	Eugene
Ruggiero, Len	U.S. Forest Service	Olympia, WA
Sample, Al	The Wilderness Society	Washington, D.C.
Santee, Nancy	League of Women Voters	Eugene
Sayre, James	none listed	Eugene
Schaller, Nancy	U.S. Forest Service	Eugene
Schoen, John	Alaska Fish & Game	Juneau, AK
Schultz, Gwynne	none listed	Eugene
Schultz, William	Bureau of Land Management	Eugene
Sherriffs, Mary	League of Women Voters	Eugene
Siddall, Jean	none listed	Portland
Smith, Jon	Student, Oregon State University	Corvallis
Smith, Kent	U.S. Forest Service	Yoncalla
Stahl, Andy	National Wildlife Federation	Eugene
Staley, George	none listed	Corvallis
Stearns, Art	Department of Natural Resources	Olympia, WA
Steiner, Stephen	Bureau of Land Management	Junction City
Steussy, R. E.	Obsidians	Eugene
Stewart, Taffy	U.S. Forest Service	Eugene
Strange, Mike	U.S. Forest Service	Eugene
Stringer, B. A.	Martin Harmsen Memorial Wildlife Sanctuary	Blodgett
Sturdevant, Debbi	Student, Oregon State University	Corvallis
Sutherland, Miley	U.S. Forest Service	Eugene
Swick, Randall	U.S. Forest Service	Eugene
Teensma, Pete	Student, University of Oregon	Eugene
Thatcher, Terence	National Wildlife Federation	Eugene
Thaxton, Gene	Obsidians	Eugene
Thomas, Charles	Bureau of Land Management	Eugene
Thompson, Tom	U.S. Forest Service	Eugene
Tietz, Chuck	U.S. Forest Service	Eugene
Topik, Chris	Student, University of Oregon	Eugene
Tryon, Don	none listed	Eugene

Registrants continued

Name	Affiliation	City
Ulrich, Rick	U.S. Forest Service	Eugene
Vazquez, Al	U.S. Forest Service	Eugene
Vermillion, Roy	U.S. Forest Service	Eugene
Versteeg, Jim	Sierra Club	Salem
Vetterick, Paul	Bureau of Land Management	Portland
Via, Jabrila	Alpha Farm	Deadwood
Via, Wali	Alpha Farm	Deadwood
Voorhies, Ray	Consultant Forester	Pleasant Hill
Waddell, William	U.S. Forest Service	Eugene
Wagner, Frank	Bureau of Land Management	Elmira
Wallmo, Mrs. Olof C.	none listed	Bozeman, MT
Watson, Jack	U.S. Forest Service	Eugene
Weir, Lynn	Smith, Brucker, Winn & Ehlerr	Seattle, WA
Wellborn, Sherry	Wassen Creek Wilderness Committee	Eugene
White, Jim	U.S. Forest Service	Eugene
Wieman, Jim	U.S. Forest Service	Idleyld Park
Williams, Gerald	U.S. Forest Service	Eugene
Williams, Jim	U.S. Forest Service	Eugene
Williams, John	U.S. Forest Service	Eugene
Williams, John D.	Student, Lane Community College	Cottage Grove
Williams, Linda	Alpha Farm	Deadwood
Wilson, Kathy	Lane County Audubon Society	Eugene
Wilson, Korin	none listed	Portland
Wilson, Roger	Bureau of Land Management	Eugene
Wilt, Daniel	U.S. Forest Service	Cottage Grove
Wolfe, Barbara	League of Women Voters	Eugene
Wood, Steve	U.S. Forest Service	Eugene
Wood, Wendeall	Umpqua Valley Audubon Society	Eugene
Wright, Pamela	Student, Lane Community College	Eugene
Wyant, Dan	Eugene Register-Guard	Eugene
Yoder, Barbara	Student, Oregon State University	Corvallis
Yuska, Joe	Student, Oregon State University	Corvallis

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Denver, CO 80225

s Card

:s : a balanced perspective.

r	Division	Date Ret'd
1bk	D-470	DEC 15 '83

DSC 1279-3a (Feb. 1977)